SEQUENCE LISTING

<110> Duvick, Jonathan P.
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       Folkerts, Otto

<120> Amino Polyol Amine Oxidase Polynucleotides and Related Polypeptides and Methods of Use

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<140> US 09/658,835
<141> 2000-09-08

<150> US 60/092,936
<151> 1998-07-25

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<151> 1999-05-21

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attgtcgatc gacgtcgatg ctggtatctc tggcaaatga gatggggtca cagctcgatt   180

ggaggacgcc cgagaagcct tgttcgcgcc accacggctt gtcccatacg aagactatct   240

tgctatagta gcccaggata gaattttccg ccaatgcttg cttctcggcg ggaagaggtg   300

gtgaaaatgt caaggtggga tacaaggttg tcggtaacga aaccancacc tttttgcttc   360

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tacaaggttg tcggtaacga aaccaccacc tttttgcttc ggaacacggc gcccgaggcc   120

gatcgtactg tacagccgga tgccgactgc tcaatttcag cgacgggggt gttgaggtgc   180

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1   5   10   15

gag acg gca cgc aaa gtc cag gcc gcc ggt ctg tcc tgc ctc gtt ctt   96
Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val Leu
            20   25   30

2

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gag gcg atg gat cgt gta ggg gga aag act ctg agc gta caa tcg ggt        144
Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser Gly
        35              40              45

ccc ggc agg acg act atc aac gac ctc ggc gct gcg tgg atc aat gac        192
Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp
        50              55              60

agc aac caa agc gaa gta tcc aga ttg ttt gaa aga ttt cat ttg gag        240
Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu Glu
65              70              75              80

ggc gag ctc cag agg acg act gga aat tca atc cat caa gca caa gac        288
Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln Asp
                85              90              95

ggt aca acc act aca gct cct tat ggt gac tcc ttg ctg agc gag gag        336
Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu
            100             105             110

gtt gca agt gca ctt gcg gaa ctc ctc ccc gta tgg tct cag ctg atc        384
Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu Ile
            115             120             125

gaa gag cat agc ctt caa gac ctc aag gcg agc cct cag gcg aag cgg        432
Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg
        130             135             140

ctc gac agt gtg agc ttc gcg cac tac tgt gag aag gaa cta aac ttg        480
Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn Leu
145             150             155             160

cct gct gtt ctc ggc gta gca aac cag atc aca cgc gct ctg ctc ggt        528
Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly
            165             170             175

gtg gaa gcc cac gag atc agc atg ctt ttt ctc acc gac tac atc aag        576
Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys
            180             185             190

agt gcc acc ggt ctc agt aat att ttc tcg gac aag aaa gac ggc ggg        624
Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly
            195             200             205

cag tat atg cga tgc aaa aca ggt atg cag tcg att tgc cat gcc atg        672
Gln Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala Met
        210             215             220

tca aag gaa ctt gtt cca ggc tca gtg cac ctc aac acc ccc gtc gct        720
Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val Ala
225             230             235             240

gaa att gag cag tcg gca tcc ggc tgt aca gta cga tcg gcc tcg ggc        768
Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser Gly
                245             250             255

gcc gtg ttc cga agc aaa aag gtg gtg gtt tcg tta ccg aca acc ttg        816
Ala Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr Leu
            260             265             270
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3

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tat ccc acc ttg aca ttt tca cca cct ctt ccc gcc gag aag caa gca         864
Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala
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ttg gcg gaa aat tct atc ctg ggc tac tat agc aag ata gtc ttc gta         912
Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val
        290                 295                 300

tgg gac aag ccg tgg tgg cgc gaa caa ggc ttc tcg ggc gtc ctc caa         960
Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu Gln
305                 310                 315                 320

tcg agc tgt gac ccc atc tca ttt gcc aga gat acc agc atc gac gtc        1008
Ser Ser Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp Val
                325                 330                 335

gat cga caa tgg tcc att acc tgt ttc atg gtc gga gac ccg gga cgg        1056
Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly Arg
                340                 345                 350

aag tgg tcc caa cag tcc aag cag gta cga caa aag tct gtc tgg gac        1104
Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp Asp
                355                 360                 365

caa ctc cgc gca gcc tac gag aac gcc ggg gcc caa gtc cca gag ccg        1152
Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu Pro
        370                 375                 380

gcc aac gtg ctc gaa atc gag tgg tcg aag cag cag tat ttc caa gga        1200
Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly
385                 390                 395                 400

gct ccg agc gcc gtc tat ggg ctg aac gat ctc atc aca ctg ggt tcg        1248
Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser
                405                 410                 415

gcg ctc aga acg ccg ttc aag agt gtt cat ttc gtt gga acg gag acg        1296
Ala Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu Thr
                420                 425                 430

tct tta gtt tgg aaa ggg tat atg gaa ggg gcc ata cga tcg ggt caa        1344
Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln
                435                 440                 445

cga ggt gct gca gaa gtt gtg gct agc ctg gtg cca gca gca tag         1389
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Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser Gly
            35              40                  45

Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp
            50              55                  60

Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu Glu
65              70              75                  80

Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln Asp
                85              90                  95

Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu
            100             105             110

Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu Ile
            115             120             125

Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg
    130             135             140

Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn Leu
145             150             155                 160

Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly
                165             170             175

Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys
                180             185             190

Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly
    195             200             205

Gln Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala Met
    210             215             220

Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val Ala
225             230             235                 240

Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser Gly
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5

Ala Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr Leu
            260   265   270

Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala
            275   280   285

Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val
    290   295   300

Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu Gln
305   310   315   320

Ser Ser Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp Val
            325   330   335

Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly Arg
            340   345   350

Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp Asp
            355   360   365

Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu Pro
    370   375   380

Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly
385   390   395   400

Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser
            405   410   415

Ala Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu Thr
            420   425   430

Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln
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Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
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6

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1               5                   10                  15

gag acg gca cgc aaa gtc cag gcc gcc ggt ctg tcc tgc ctc gtt ctt          96
Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val Leu
                20                  25                  30

gag gcg atg gat cgt gta ggg gga aag act ctg agc gta caa tcg ggt         144
Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser Gly
            35                  40                  45

ccc ggc agg acg act atc aac gac ctc ggc gct gcg tgg atc aat gac         192
Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp
        50                  55                  60

agc aac caa agc gaa gta tcc aga ttg ttt gaa aga ttt cat ttg gag         240
Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu Glu
65                  70                  75                  80

ggc gag ctc cag agg acg act gga aat tca atc cat caa gca caa gac         288
Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln Asp
                85                  90                  95

ggt aca acc act aca gct cct tat ggt gac tcc ttg ctg agc gag gag         336
Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu
            100                 105                 110

gtt gca agt gca ctt gcg gaa ctc ctc ccc gta tgg tct cag ctg atc         384
Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu Ile
        115                 120                 125

gaa gag cat agc ctt caa gac ctc aag gcg agc cct cag gcg aag cgg         432
Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg
    130                 135                 140

ctc gac agt gtg agc ttc gcg cac tac tgt gag aag gaa cta aac ttg         480
Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn Leu
145                 150                 155                 160

cct gct gtt ctc ggc gta gca aac cag atc aca cgc gct ctg ctc ggt         528
Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly
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7

165   170   175

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gtg gaa gcc cac gag atc agc atg ctt ttt ctc acc gac tac atc aag        576
Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys
            180                 185                 190

agt gcc acc ggt ctc agt aat att ttc tcg gac aag aaa gac ggc ggg        624
Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly
            195                 200                 205

cag tat gtg cga tgc aaa aca ggtgcgtgtg gtgtcgtctc aggtggggga          675
Gln Tyr Val Arg Cys Lys Thr
            210                 215

ctcgtttctc agtggtcatt cca ggt atg cag tcg att tgc cat gcc atg tca      728
                        Gly Met Gln Ser Ile Cys His Ala Met Ser
                            220                 225

aag gaa ctt gtt cca ggc tca gtg cac ctc aac acc ccc gtc gct gaa        776
Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val Ala Glu
                230                 235                 240

att gag cag tcg gca tcc ggc tgt aca gta cga tcg gcc tcg ggc gcc        824
Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala
                245                 250                 255

gtg ttc cga agc aaa aag gtg gtg gtt tcg tta ccg aca acc ttg tat        872
Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr
            260                 265                 270

ccc acc ttg aca ttt tca cca cct ctt ccc gcc gag aag caa gca ttg        920
Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu
            275                 280                 285

gcg gaa aat tct atc ctg ggc tac tat agc aag ata gtc ttc gta tgg        968
Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp
290                 295                 300                 305

gac aag ccg tgg tgg cgc gaa caa ggc ttc tcg ggc gtc ctc caa tcg       1016
Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser
                310                 315                 320

agc tgt gac ccc atc tca ttt gcc aga gat acc agc atc gac gtc gat       1064
Ser Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp
                325                 330                 335

cga caa tgg tcc att acc tgt ttc atg gtc gga gac ccg gga cgg aag       1112
Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys
                340                 345                 350

tgg tcc caa cag tcc aag cag gta cga caa aag tct gtc tgg gac caa       1160
Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln
                355                 360                 365

ctc cgc gca gcc tac gag aac gcc ggg gcc caa gtc cca gag ccg gcc       1208
Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala
370                 375                 380                 385

aac gtg ctc gaa atc gag tgg tcg aag cag cag tat ttc caa gga gct       1256
Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala
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8

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Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala
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ccg agc gcc gtc tat ggg ctg aac gat ctc atc aca ctg ggt tcg gcg      1304
Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala
            405             410             415

ctc aga acg ccg ttc aag agt gtt cat ttc gtt gga acg gag acg tct      1352
Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu Thr Ser
            420             425             430

tta gtt tgg aaa ggg tat atg gaa ggg gcc ata cga tcg ggt caa cga      1400
Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg
            435             440             445

ggt gct gca gaa gtt gtg gct agc ctg gtg cca gca gca tag            1442
Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
450             455             460


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<212>   PRT
<213>   Exophiala spinifera

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Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val Leu
            20              25              30


Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser Gly
            35              40              45


Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp
    50              55              60


Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu Glu
65              70              75              80


Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln Asp
                85              90              95


Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu
                100             105             110


Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu Ile
            115             120             125
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9

Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg
130   135   140

Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn Leu
145   150   155   160

Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly
165   170   175

Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys
180   185   190

Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly
195   200   205

Gln Tyr Val Arg Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala Met
210   215   220

Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val Ala
225   230   235   240

Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser Gly
245   250   255

Ala Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr Leu
260   265   270

Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala
275   280   285

Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val
290   295   300

Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu Gln
305   310   315   320

Ser Ser Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp Val
325   330   335

Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly Arg
340   345   350

Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp Asp
355   360   365

10

Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu Pro
    370   375   380

Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly
385   390   395   400

Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser
            405   410   415

Ala Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu Thr
            420   425   430

Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln
    435   440   445

Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
    450   455   460

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1   5   10   15

Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val Leu
            20   25   30

Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser Gly
            35   40   45

Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp
    50   55   60

Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu Glu
65   70   75   80

Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln Asp
                85   90   95

Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu
            100   105   110

11

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Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu Ile
        115             120             125

Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg
        130             135             140

Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn Leu
145             150             155             160

Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly
            165             170             175

Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys
            180             185             190

Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly
            195             200             205

Gln Tyr Val Arg Cys Lys Thr Gly Ala Cys Gly Val Val Ser Gly Gly
    210             215             220

Gly Leu Val Ser Gln Trp Ser Phe Gln Val Cys Ser Arg Phe Ala Met
225             230             235             240

Pro Cys Gln Arg Asn Leu Phe Gln Ala Gln Cys Thr Ser Thr Pro Pro
            245             250             255

Ser Leu Lys Leu Ser Ser Arg His Pro Ala Val Gln Tyr Asp Arg Pro
            260             265             270

Arg Ala Pro Cys Ser Glu Ala Lys Arg Trp Trp Phe Arg Tyr Arg Gln
            275             280             285

Pro Cys Ile Pro Pro His Phe His His Leu Phe Pro Pro Arg Ser Lys
    290             295             300

His Trp Arg Lys Ile Leu Ser Trp Ala Thr Ile Ala Arg Ser Ser Tyr
305             310             315             320

Gly Thr Ser Arg Gly Gly Ala Asn Lys Ala Ser Arg Ala Ser Ser Asn
            325             330             335

Arg Ala Val Thr Pro Ser His Leu Pro Glu Ile Pro Ala Ser Thr Ser
            340             345             350
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12

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Ile Asp Asn Gly Pro Leu Pro Val Ser Trp Ser Glu Thr Arg Asp Gly
        355             360             365

Ser Gly Pro Asn Ser Pro Ser Arg Tyr Asp Lys Ser Leu Ser Gly Thr
        370             375             380

Asn Ser Ala Gln Pro Thr Arg Thr Pro Gly Pro Lys Ser Gln Ser Arg
385             390             395             400

Pro Thr Cys Ser Lys Ser Ser Gly Arg Ser Ser Ser Ile Ser Lys Glu
            405             410             415

Leu Arg Ala Pro Ser Met Gly Thr Ile Ser Ser His Trp Val Arg Arg
            420             425             430

Ser Glu Arg Arg Ser Arg Val Phe Ile Ser Leu Glu Arg Arg Arg Leu
        435             440             445

Phe Gly Lys Gly Ile Trp Lys Gly Pro Tyr
    450             455
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aaa gac aac gtt gcg gac gtg gta gtg gtg ggc gct ggc ttg agc ggt        48
Lys Asp Asn Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly
1               5                       10              15

ttg gag acg gca cgc aaa gtc cag gcc gcc ggt ctg tcc tgc ctc gtt        96
Leu Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val
                20                  25                  30

ctt gag gcg atg gat cgt gta ggg gga aag act ctg agc gta caa tcg       144
Leu Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser
            35                  40                  45
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ggt ccc ggc agg acg act atc aac gac ctc ggc gct gcg tgg atc aat        192
Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn
    50              55              60

gac agc aac caa agc gaa gta tcc aga ttg ttt gaa aga ttt cat ttg        240
Asp Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu
65              70              75              80

gag ggc gag ctc cag agg acg act gga aat tca atc cat caa gca caa        288
Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln
                85              90              95

gac ggt aca acc act aca gct cct tat ggt gac tcc ttg ctg agc gag        336
Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu
            100             105             110

gag gtt gca agt gca ctt gcg gaa ctc ctc ccc gta tgg tct cag ctg        384
Glu Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu
            115             120             125

atc gaa gag cat agc ctt caa gac ctc aag gcg agc cct cag gcg aag        432
Ile Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys
    130             135             140

cgg ctc gac agt gtg agc ttc gcg cac tac tgt gag aag gaa cta aac        480
Arg Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn
145             150             155             160

ttg cct gct gtt ctc ggc gta gca aac cag atc aca cgc gct ctg ctc        528
Leu Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu
                165             170             175

ggt gtg gaa gcc cac gag atc agc atg ctt ttt ctc acc gac tac atc        576
Gly Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile
            180             185             190

aag agt gcc acc ggt ctc agt aat att ttc tcg gac aag aaa gac ggc        624
Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly
            195             200             205

ggg cag tat atg cga tgc aaa aca ggt atg cag tcg att tgc cat gcc        672
Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala
    210             215             220

atg tca aag gaa ctt gtt cca ggc tca gtg cac ctc aac acc ccc gtc        720
Met Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val
225             230             235             240

gct gaa att gag cag tcg gca tcc ggc tgt aca gta cga tcg gcc tcg        768
Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser
                245             250             255

ggc gcc gtg ttc cga agc aaa aag gtg gtg gtt tcg tta ccg aca acc        816
Gly Ala Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr
            260             265             270

ttg tat ccc acc ttg aca ttt tca cca cct ctt ccc gcc gag aag caa        864
Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln
            275             280             285
```

14

```
gca ttg gcg gaa aat tct atc ctg ggc tac tat agc aag ata gtc ttc    912
Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe
290                 295                 300

gta tgg gac aag ccg tgg tgg cgc gaa caa ggc ttc tcg ggc gtc ctc    960
Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu
305                 310                 315                 320

caa tcg agc tgt gac ccc atc tca ttt gcc aga gat acc agc atc gac   1008
Gln Ser Ser Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp
                325                 330                 335

gtc gat cga caa tgg tcc att acc tgt ttc atg gtc gga gac ccg gga   1056
Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly
                340                 345                 350

cgg aag tgg tcc caa cag tcc aag cag gta cga caa aag tct gtc tgg   1104
Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp
                355                 360                 365

gac caa ctc cgc gca gcc tac gag aac gcc ggg gcc caa gtc cca gag   1152
Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu
370                 375                 380

ccg gcc aac gtg ctc gaa atc gag tgg tcg aag cag cag tat ttc caa   1200
Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln
385                 390                 395                 400

gga gct ccg agc gcc gtc tat ggg ctg aac gat ctc atc aca ctg ggt   1248
Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly
                405                 410                 415

tcg gcg ctc aga acg ccg ttc aag agt gtt cat ttc gtt gga acg gag   1296
Ser Ala Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu
                420                 425                 430

acg tct tta gtt tgg aaa ggg tat atg gaa ggg gcc ata cga tcg ggt   1344
Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly
                435                 440                 445

caa cga ggt gct gca gaa gtt gtg gct agc ctg gtg cca gca gca tag   1392
Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
450                 455                 460


<210>  11
<211>  463
<212>  PRT
<213>  Exophiala spinifera

<220>
<221>  misc_feature
<222>  (1)..(3)
<223>  Extra lysine in K:trAPAO

<400>  11

Lys Asp Asn Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly
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15

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          1                    5                        10                       15

Leu Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val
         20          25               30

Leu Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser
         35          40               45

Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn
         50          55               60

Asp Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu
65            70               75                  80

Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln
              85               90                  95

Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu
              100              105                 110

Glu Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu
              115              120                 125

Ile Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys
         130              135                 140

Arg Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn
145              150                 155                    160

Leu Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu
              165              170                 175

Gly Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile
              180              185                 190

Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly
         195              200                 205

Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala
         210              215                 220

Met Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val
225              230                 235                    240
```

16

```
Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser
                245             250                 255

Gly Ala Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr
                260             265                 270

Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln
                275             280                 285

Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe
    290             295                 300

Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu
305             310                 315                 320

Gln Ser Ser Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp
                325             330                 335

Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly
                340             345                 350

Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp
                355             360                 365

Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu
    370             375                 380

Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln
385                 390             395                 400

Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly
                405             410                 415

Ser Ala Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu
                420             425                 430

Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly
                435             440                 445

Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
    450             455                 460


<210>   12
<211>   34
<212>   DNA


                            17
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<213>   Artificial

<220>
<223>   Primer sequence designed for cloning DNA into expression vectors,
          N23256

<400>   12
ggggaattca aagacaacgt tgcggacgtg gtag   34

<210>   13
<211>   34
<212>   DNA
<213>   Artificial

<220>
<223>   Primer sequence designed for cloning DNA into expression vectors
          N23256

<400>   13
ggggcggccg cctatgctgc tggcaccagg ctag   34

<210>   14
<211>   29
<212>   DNA
<213>   Artificial

<220>
<223>   Designed oligonucleotide for 3' RACE, N21965

<400>   14
tggtttcgtt accgacaacc ttgtatccc   29

<210>   15
<211>   28
<212>   DNA
<213>   Artificial

<220>
<223>   Designed oligonucleotide for 5' RACE, N21968

<400>   15
gagttggtcc cagacagact tttgtcgt   28

<210>   16
<211>   1673
<212>   DNA
<213>   Exophiala spinifera

<220>
<221>   sig_peptide
<222>   (1)..(267)
<223>   yeast alpha mating factor secretion signal

<220>

18

<221> CDS
<222> (1)..(1662)
<223>

<400> 16

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atg aga ttt cct tca att ttt act gct gtt tta ttc gca gca tcc tcc        48
Met Arg Phe Pro Ser Ile Phe Thr Ala Val Leu Phe Ala Ala Ser Ser
1               5                   10                  15

gca tta gct gct cca gtc aac act aca aca gaa gat gaa acg gca caa        96
Ala Leu Ala Ala Pro Val Asn Thr Thr Thr Glu Asp Glu Thr Ala Gln
                20                  25                  30

att ccg gct gaa gct gtc atc ggt tac tca gat tta gaa ggg gat ttc       144
Ile Pro Ala Glu Ala Val Ile Gly Tyr Ser Asp Leu Glu Gly Asp Phe
            35                  40                  45

gat gtt gct gtt ttg cca ttt tcc aac agc aca aat aac ggg tta ttg       192
Asp Val Ala Val Leu Pro Phe Ser Asn Ser Thr Asn Asn Gly Leu Leu
        50                  55                  60

ttt ata aat act act att gcc agc att gct gct aaa gaa gaa ggg gta       240
Phe Ile Asn Thr Thr Ile Ala Ser Ile Ala Ala Lys Glu Glu Gly Val
65                  70                  75                  80

tct ctc gag aaa aga gag gct gaa gct gaa ttc aaa gac aac gtt gcg       288
Ser Leu Glu Lys Arg Glu Ala Glu Ala Glu Phe Lys Asp Asn Val Ala
                85                  90                  95

gac gtg gta gtg gtg ggc gct ggc ttg agc ggt ttg gag acg gca cgc       336
Asp Val Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg
                100                 105                 110

aaa gtc cag gcc gcc ggt ctg tcc tgc ctc gtt ctt gag gcg atg gat       384
Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp
            115                 120                 125

cgt gta ggg gga aag act ctg agc gta caa tcg ggt ccc ggc agg acg       432
Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr
        130                 135                 140

act atc aac gac ctc ggc gct gcg tgg atc aat gac agc aac caa agc       480
Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser
145                 150                 155                 160

gaa gta tcc aga ttg ttt gaa aga ttt cat ttg gag ggc gag ctc cag       528
Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln
                165                 170                 175

agg acg act gga aat tca atc cat caa gca caa gac ggt aca acc act       576
Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr
            180                 185                 190

aca gct cct tat ggt gac tcc ttg ctg agc gag gag gtt gca agt gca       624
Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala
            195                 200                 205

ctt gcg gaa ctc ctc ccc gta tgg tct cag ctg atc gaa gag cat agc       672
Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser
```

19

```
ctt caa gac ctc aag gcg agc cct cag gcg aag cgg ctc gac agt gtg    720
Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val
225                 230                 235                 240

agc ttc gcg cac tac tgt gag aag gaa cta aac ttg cct gct gtt ctc    768
Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu
                    245                 250                 255

ggc gta gca aac cag atc aca cgc gct ctg ctc ggt gtg gaa gcc cac    816
Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His
                260                 265                 270

gag atc agc atg ctt ttt ctc acc gac tac atc aag agt gcc acc ggt    864
Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly
                275                 280                 285

ctc agt aat att ttc tcg gac aag aaa gac ggc ggg cag tat atg cga    912
Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg
        290                 295                 300

tgc aaa aca ggt atg cag tcg att tgc cat gcc atg tca aag gaa ctt    960
Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu
305                 310                 315                 320

gtt cca ggc tca gtg cac ctc aac acc ccc gtc gct gaa att gag cag   1008
Val Pro Gly Ser Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln
                    325                 330                 335

tcg gca tcc ggc tgt aca gta cga tcg gcc tcg ggc gcc gtg ttc cga   1056
Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg
                340                 345                 350

agc aaa aag gtg gtg gtt tcg tta ccg aca acc ttg tat ccc acc ttg   1104
Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu
                355                 360                 365

aca ttt tca cca cct ctt ccc gcc gag aag caa gca ttg gcg gaa aat   1152
Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn
        370                 375                 380

tct atc ctg ggc tac tat agc aag ata gtc ttc gta tgg gac aag ccg   1200
Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro
385                 390                 395                 400

tgg tgg cgc gaa caa ggc ttc tcg ggc gtc ctc caa tcg agc tgt gac   1248
Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp
                    405                 410                 415

ccc atc tca ttt gcc aga gat acc agc atc gac gtc gat cga caa tgg   1296
Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp
                420                 425                 430

tcc att acc tgt ttc atg gtc gga gac ccg gga cgg aag tgg tcc caa   1344
Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln
                435                 440                 445

cag tcc aag cag gta cga caa aag tct gtc tgg gac caa ctc cgc gca   1392
```
20

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Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala
    450             455             460

gcc tac gag aac gcc ggg gcc caa gtc cca gag ccg gcc aac gtg ctc     1440
Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu
465             470             475             480

gaa atc gag tgg tcg aag cag cag tat ttc caa gga gct ccg agc gcc     1488
Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala
                485             490             495

gtc tat ggg ctg aac gat ctc atc aca ctg ggt tcg gcg ctc aga acg     1536
Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr
            500             505             510

ccg ttc aag agt gtt cat ttc gtt gga acg gag acg tct tta gtt tgg     1584
Pro Phe Lys Ser Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp
        515             520             525

aaa ggg tat atg gaa ggg gcc ata cga tcg ggt caa cga ggt gct gca     1632
Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala
    530             535             540

gaa gtt gtg gct agc ctg gtg cca gca gca taggcggccg c              1673
Glu Val Val Ala Ser Leu Val Pro Ala Ala
545             550


<210>  17
<211>  554
<212>  PRT
<213>  Exophiala spinifera

<400>  17

Met Arg Phe Pro Ser Ile Phe Thr Ala Val Leu Phe Ala Ala Ser Ser
1               5               10              15


Ala Leu Ala Ala Pro Val Asn Thr Thr Thr Glu Asp Glu Thr Ala Gln
            20              25              30


Ile Pro Ala Glu Ala Val Ile Gly Tyr Ser Asp Leu Glu Gly Asp Phe
            35              40              45


Asp Val Ala Val Leu Pro Phe Ser Asn Ser Thr Asn Asn Gly Leu Leu
    50              55              60


Phe Ile Asn Thr Thr Ile Ala Ser Ile Ala Ala Lys Glu Glu Gly Val
65              70              75              80


Ser Leu Glu Lys Arg Glu Ala Glu Ala Glu Phe Lys Asp Asn Val Ala
                85              90              95
```

21

```
Asp Val Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg
          100               105               110

Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp
          115               120               125

Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr
130               135               140

Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser
145               150               155               160

Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln
               165               170               175

Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr
          180               185               190

Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala
          195               200               205

Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser
          210               215               220

Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val
225               230               235               240

Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu
               245               250               255

Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His
          260               265               270

Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly
          275               280               285

Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg
          290               295               300

Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu
305               310               315               320

Val Pro Gly Ser Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln
               325               330               335

                                22
```

```
Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg
            340                 345                 350

Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu
            355                 360                 365

Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn
    370                 375                 380

Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro
385                 390                 395                 400

Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp
                405                 410                 415

Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp
                420                 425                 430

Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln
            435                 440                 445

Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala
    450                 455                 460

Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu
465                 470                 475                 480

Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala
                485                 490                 495

Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr
                500                 505                 510

Pro Phe Lys Ser Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp
            515                 520                 525

Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala
            530                 535                 540

Glu Val Val Ala Ser Leu Val Pro Ala Ala
545                 550

<210>   18
<211>   2079
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23

<212> DNA
<213> Unknown

<220>
<223> GST:K:trAPAO 2079 for bacterial expression

<220>
<221> CDS
<222> (1)..(2076)
<223>

<220>
<221> misc_feature
<222> (1)..(687)
<223> gst fusion + polylinker

<220>
<221> misc_feature
<222> (688)..(2076)
<223> K:trAPAO

<220>
<221> misc_feature
<222> (688)..(690)
<223> Extra lysine

<400> 18

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atg tcc cct ata cta ggt tat tgg aaa att aag ggc ctt gtg caa ccc        48
Met Ser Pro Ile Leu Gly Tyr Trp Lys Ile Lys Gly Leu Val Gln Pro
1               5                   10                  15

act cga ctt ctt ttg gaa tat ctt gaa gaa aaa tat gaa gag cat ttg        96
Thr Arg Leu Leu Leu Glu Tyr Leu Glu Glu Lys Tyr Glu Glu His Leu
                20                  25                  30

tat gag cgc gat gaa ggt gat aaa tgg cga aac aaa aag ttt gaa ttg       144
Tyr Glu Arg Asp Glu Gly Asp Lys Trp Arg Asn Lys Lys Phe Glu Leu
                35                  40                  45

ggt ttg gag ttt ccc aat ctt cct tat tat att gat ggt gat gtt aaa       192
Gly Leu Glu Phe Pro Asn Leu Pro Tyr Tyr Ile Asp Gly Asp Val Lys
        50                  55                  60

tta aca cag tct atg gcc atc ata cgt tat ata gct gac aag cac aac       240
Leu Thr Gln Ser Met Ala Ile Ile Arg Tyr Ile Ala Asp Lys His Asn
65                  70                  75                  80

atg ttg ggt ggt tgt cca aaa gag cgt gca gag att tca atg ctt gaa       288
Met Leu Gly Gly Cys Pro Lys Glu Arg Ala Glu Ile Ser Met Leu Glu
                85                  90                  95

gga gcg gtt ttg gat att aga tac ggt gtt tcg aga att gca tat agt       336
Gly Ala Val Leu Asp Ile Arg Tyr Gly Val Ser Arg Ile Ala Tyr Ser
                100                 105                 110

aaa gac ttt gaa act ctc aaa gtt gat ttt ctt agc aag cta cct gaa       384
```

24

```
Lys Asp Phe Glu Thr Leu Lys Val Asp Phe Leu Ser Lys Leu Pro Glu
        115                 120                 125

atg ctg aaa atg ttc gaa gat cgt tta tgt cat aaa aca tat tta aat      432
Met Leu Lys Met Phe Glu Asp Arg Leu Cys His Lys Thr Tyr Leu Asn
        130                 135                 140

ggt gat cat gta acc cat cct gac ttc atg ttg tat gac gct ctt gat      480
Gly Asp His Val Thr His Pro Asp Phe Met Leu Tyr Asp Ala Leu Asp
145                 150                 155                 160

gtt gtt tta tac atg gac cca atg tgc ctg gat gcg ttc cca aaa tta      528
Val Val Leu Tyr Met Asp Pro Met Cys Leu Asp Ala Phe Pro Lys Leu
                165                 170                 175

gtt tgt ttt aaa aaa cgt att gaa gct atc cca caa att gat aag tac      576
Val Cys Phe Lys Lys Arg Ile Glu Ala Ile Pro Gln Ile Asp Lys Tyr
                180                 185                 190

ttg aaa tcc agc aag tat ata gca tgg cct ttg cag ggc tgg caa gcc      624
Leu Lys Ser Ser Lys Tyr Ile Ala Trp Pro Leu Gln Gly Trp Gln Ala
            195                 200                 205

acg ttt ggt ggt ggc gac cat cct cca aaa tcg gat ctg gtt ccg cgt      672
Thr Phe Gly Gly Gly Asp His Pro Pro Lys Ser Asp Leu Val Pro Arg
        210                 215                 220

gga tcc ccg gaa ttc aaa gac aac gtt gcg gac gtg gta gtg gtg ggc      720
Gly Ser Pro Glu Phe Lys Asp Asn Val Ala Asp Val Val Val Val Gly
225                 230                 235                 240

gct ggc ttg agc ggt ttg gag acg gca cgc aaa gtc cag gcc gcc ggt      768
Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val Gln Ala Ala Gly
                245                 250                 255

ctg tcc tgc ctc gtt ctt gag gcg atg gat cgt gta ggg gga aag act      816
Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val Gly Gly Lys Thr
                260                 265                 270

ctg agc gta caa tcg ggt ccc ggc agg acg act atc aac gac ctc ggc      864
Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly
                275                 280                 285

gct gcg tgg atc aat gac agc aac caa agc gaa gta tcc aga ttg ttt      912
Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val Ser Arg Leu Phe
        290                 295                 300

gaa aga ttt cat ttg gag ggc gag ctc cag agg acg act gga aat tca      960
Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser
305                 310                 315                 320

atc cat caa gca caa gac ggt aca acc act aca gct cct tat ggt gac     1008
Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp
                325                 330                 335

tcc ttg ctg agc gag gag gtt gca agt gca ctt gcg gaa ctc ctc ccc     1056
Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala Glu Leu Leu Pro
        340                 345                 350
```

25

```
gta tgg tct cag ctg atc gaa gag cat agc ctt caa gac ctc aag gcg      1104
Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln Asp Leu Lys Ala
        355             360             365

agc cct cag gcg aag cgg ctc gac agt gtg agc ttc gcg cac tac tgt      1152
Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe Ala His Tyr Cys
        370             375             380

gag aag gaa cta aac ttg cct gct gtt ctc ggc gta gca aac cag atc      1200
Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val Ala Asn Gln Ile
385             390             395             400

aca cgc gct ctg ctc ggt gtg gaa gcc cac gag atc agc atg ctt ttt      1248
Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile Ser Met Leu Phe
                405             410             415

ctc acc gac tac atc aag agt gcc acc ggt ctc agt aat att ttc tcg      1296
Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser
                420             425             430

gac aag aaa gac ggc ggg cag tat atg cga tgc aaa aca ggt atg cag      1344
Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln
            435             440             445

tcg att tgc cat gcc atg tca aag gaa ctt gtt cca ggc tca gtg cac      1392
Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro Gly Ser Val His
            450             455             460

ctc aac acc ccc gtc gct gaa att gag cag tcg gca tcc ggc tgt aca      1440
Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr
465             470             475             480

gta cga tcg gcc tcg ggc gcc gtg ttc cga agc aaa aag gtg gtg gtt      1488
Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys Lys Val Val Val
                485             490             495

tcg tta ccg aca acc ttg tat ccc acc ttg aca ttt tca cca cct ctt      1536
Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu
            500             505             510

ccc gcc gag aag caa gca ttg gcg gaa aat tct atc ctg ggc tac tat      1584
Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr
            515             520             525

agc aag ata gtc ttc gta tgg gac aag ccg tgg tgg cgc gaa caa ggc      1632
Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly
            530             535             540

ttc tcg ggc gtc ctc caa tcg agc tgt gac ccc atc tca ttt gcc aga      1680
Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile Ser Phe Ala Arg
545             550             555             560

gat acc agc atc gac gtc gat cga caa tgg tcc att acc tgt ttc atg      1728
Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met
                565             570             575

gtc gga gac ccg gga cgg aag tgg tcc caa cag tcc aag cag gta cga      1776
Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg
            580             585             590
```

26

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caa aag tct gtc tgg gac caa ctc cgc gca gcc tac gag aac gcc ggg      1824
Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly
        595                 600                 605

gcc caa gtc cca gag ccg gcc aac gtg ctc gaa atc gag tgg tcg aag      1872
Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys
        610                 615                 620

cag cag tat ttc caa gga gct ccg agc gcc gtc tat ggg ctg aac gat      1920
Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp
625                 630                 635                 640

ctc atc aca ctg ggt tcg gcg ctc aga acg ccg ttc aag agt gtt cat      1968
Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe Lys Ser Val His
                645                 650                 655

ttc gtt gga acg gag acg tct tta gtt tgg aaa ggg tat atg gaa ggg      2016
Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly
                660                 665                 670

gcc ata cga tcg ggt caa cga ggt gct gca gaa gtt gtg gct agc ctg      2064
Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu
                675                 680                 685

gtg cca gca gca tag                                                  2079
Val Pro Ala Ala
        690


<210>   19
<211>   692
<212>   PRT
<213>   Unknown

<220>
<223>   GST:K:trAPAO 2079   for bacterial expression

<220>
<221>   misc_feature
<222>   (1)..(687)
<223>   gst fusion + polylinker

<220>
<221>   misc_feature
<222>   (688)..(2076)
<223>   K:trAPAO

<220>
<221>   misc_feature
<222>   (688)..(690)
<223>   Extra lysine

<400>   19

Met Ser Pro Ile Leu Gly Tyr Trp Lys Ile Lys Gly Leu Val Gln Pro
1               5                   10                  15
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27

Thr Arg Leu Leu Leu Glu Tyr Leu Glu Glu Lys Tyr Glu Glu His Leu
        20   25   30

Tyr Glu Arg Asp Glu Gly Asp Lys Trp Arg Asn Lys Lys Phe Glu Leu
        35   40   45

Gly Leu Glu Phe Pro Asn Leu Pro Tyr Tyr Ile Asp Gly Asp Val Lys
        50   55   60

Leu Thr Gln Ser Met Ala Ile Ile Arg Tyr Ile Ala Asp Lys His Asn
65   70   75   80

Met Leu Gly Gly Cys Pro Lys Glu Arg Ala Glu Ile Ser Met Leu Glu
                85   90   95

Gly Ala Val Leu Asp Ile Arg Tyr Gly Val Ser Arg Ile Ala Tyr Ser
        100   105   110

Lys Asp Phe Glu Thr Leu Lys Val Asp Phe Leu Ser Lys Leu Pro Glu
        115   120   125

Met Leu Lys Met Phe Glu Asp Arg Leu Cys His Lys Thr Tyr Leu Asn
        130   135   140

Gly Asp His Val Thr His Pro Asp Phe Met Leu Tyr Asp Ala Leu Asp
145   150   155   160

Val Val Leu Tyr Met Asp Pro Met Cys Leu Asp Ala Phe Pro Lys Leu
                165   170   175

Val Cys Phe Lys Lys Arg Ile Glu Ala Ile Pro Gln Ile Asp Lys Tyr
                180   185   190

Leu Lys Ser Ser Lys Tyr Ile Ala Trp Pro Leu Gln Gly Trp Gln Ala
        195   200   205

Thr Phe Gly Gly Gly Asp His Pro Pro Lys Ser Asp Leu Val Pro Arg
        210   215   220

Gly Ser Pro Glu Phe Lys Asp Asn Val Ala Asp Val Val Val Val Gly
225   230   235   240

Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val Gln Ala Ala Gly
        245   250   255

28

```
Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val Gly Gly Lys Thr
        260             265             270

Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly
        275             280             285

Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val Ser Arg Leu Phe
290             295             300

Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser
305             310             315             320

Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp
        325             330             335

Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala Glu Leu Leu Pro
        340             345             350

Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln Asp Leu Lys Ala
        355             360             365

Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe Ala His Tyr Cys
        370             375             380

Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val Ala Asn Gln Ile
385             390             395             400

Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile Ser Met Leu Phe
                405             410             415

Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser
                420             425             430

Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln
        435             440             445

Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro Gly Ser Val His
        450             455             460

Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr
465             470             475             480

Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys Lys Val Val Val
                485             490             495
```

29

Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu
        500   505   510

Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr
        515   520   525

Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly
        530   535   540

Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile Ser Phe Ala Arg
545   550   555   560

Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met
                565   570   575

Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg
            580   585   590

Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly
        595   600   605

Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys
    610   615   620

Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp
625   630   635   640

Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe Lys Ser Val His
            645   650   655

Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly
            660   665   670

Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu
        675   680   685

Val Pro Ala Ala
    690

<210>   20
<211>   1464
<212>   DNA
<213>   Unknown

30

<220>
<223>   K:trAPAO translational fusion with barley alpha amylase

<220>
<221>   sig_peptide
<222>   (1)..(72)
<223>   Barley alpha amylase signal sequence

<220>
<221>   misc_feature
<222>   (73)..(1464)
<223>   K:trAPAO cDNA

<220>
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<222>   (1)..(1461)
<223>

<220>
<221>   misc_feature
<222>   (73)..(75)
<223>   Added lysine residue

<400>   20
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atg gcc aac aag cac ctg agc ctc tcc ctc ttc ctc gtg ctc ctc ggc      48
Met Ala Asn Lys His Leu Ser Leu Ser Leu Phe Leu Val Leu Leu Gly
1               5                   10                  15

ctc tcc gcc tcc ctc gcc agc ggc aaa gac aac gtt gcg gac gtg gta      96
Leu Ser Ala Ser Leu Ala Ser Gly Lys Asp Asn Val Ala Asp Val Val
            20                  25                  30

gtg gtg ggc gct ggc ttg agc ggt ttg gag acg gca cgc aaa gtc cag     144
Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val Gln
        35                  40                  45

gcc gcc ggt ctg tcc tgc ctc gtt ctt gag gcg atg gat cgt gta ggg     192
Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val Gly
    50                  55                  60

gga aag act ctg agc gta caa tcg ggt ccc ggc agg acg act atc aac     240
Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile Asn
65                  70                  75                  80

gac ctc ggc gct gcg tgg atc aat gac agc aac caa agc gaa gta tcc     288
Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val Ser
                85                  90                  95

aga ttg ttt gaa aga ttt cat ttg gag ggc gag ctc cag agg acg act     336
Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr Thr
                100                 105                 110

gga aat tca atc cat caa gca caa gac ggt aca acc act aca gct cct     384
Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala Pro
            115                 120                 125
```

31

```
tat ggt gac tcc ttg ctg agc gag gag gtt gca agt gca ctt gcg gaa        432
Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala Glu
    130                 135                 140

ctc ctc ccc gta tgg tct cag ctg atc gaa gag cat agc ctt caa gac        480
Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln Asp
145                 150                 155                 160

ctc aag gcg agc cct cag gcg aag cgg ctc gac agt gtg agc ttc gcg        528
Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe Ala
                    165                 170                 175

cac tac tgt gag aag gaa cta aac ttg cct gct gtt ctc ggc gta gca        576
His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val Ala
                180                 185                 190

aac cag atc aca cgc gct ctg ctc ggt gtg gaa gcc cac gag atc agc        624
Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile Ser
            195                 200                 205

atg ctt ttt ctc acc gac tac atc aag agt gcc acc ggt ctc agt aat        672
Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser Asn
    210                 215                 220

att ttc tcg gac aag aaa gac ggc ggg cag tat atg cga tgc aaa aca        720
Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys Thr
225                 230                 235                 240

ggt atg cag tcg att tgc cat gcc atg tca aag gaa ctt gtt cca ggc        768
Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro Gly
                    245                 250                 255

tca gtg cac ctc aac acc ccc gtc gct gaa att gag cag tcg gca tcc        816
Ser Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala Ser
                260                 265                 270

ggc tgt aca gta cga tcg gcc tcg ggc gcc gtg ttc cga agc aaa aag        864
Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys Lys
            275                 280                 285

gtg gtg gtt tcg tta ccg aca acc ttg tat ccc acc ttg aca ttt tca        912
Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe Ser
    290                 295                 300

cca cct ctt ccc gcc gag aag caa gca ttg gcg gaa aat tct atc ctg        960
Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile Leu
305                 310                 315                 320

ggc tac tat agc aag ata gtc ttc gta tgg gac aag ccg tgg tgg cgc       1008
Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp Arg
                    325                 330                 335

gaa caa ggc ttc tcg ggc gtc ctc caa tcg agc tgt gac ccc atc tca       1056
Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile Ser
                    340                 345                 350

ttt gcc aga gat acc agc atc gac gtc gat cga caa tgg tcc att acc       1104
Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile Thr
                355                 360                 365
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32

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tgt ttc atg gtc gga gac ccg gga cgg aag tgg tcc caa cag tcc aag    1152
Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser Lys
    370             375             380

cag gta cga caa aag tct gtc tgg gac caa ctc cgc gca gcc tac gag    1200
Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr Glu
385             390             395             400

aac gcc ggg gcc caa gtc cca gag ccg gcc aac gtg ctc gaa atc gag    1248
Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile Glu
                405             410             415

tgg tcg aag cag cag tat ttc caa gga gct ccg agc gcc gtc tat ggg    1296
Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr Gly
            420             425             430

ctg aac gat ctc atc aca ctg ggt tcg gcg ctc aga acg ccg ttc aag    1344
Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe Lys
        435             440             445

agt gtt cat ttc gtt gga acg gag acg tct tta gtt tgg aaa ggg tat    1392
Ser Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly Tyr
    450             455             460

atg gaa ggg gcc ata cga tcg ggt caa cga ggt gct gca gaa gtt gtg    1440
Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val Val
465             470             475             480

gct agc ctg gtg cca gca gca tag                                    1464
Ala Ser Leu Val Pro Ala Ala
            485
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<210>   21
<211>   487
<212>   PRT
<213>   Unknown

<220>
<223>   K:trAPAO translational fusion with barley alpha amylase

<220>
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<222>   (73)..(1464)
<223>   K:trAPAO cDNA

<220>
<221>   misc_feature
<222>   (73)..(75)
<223>   Added lysine residue

<400>   21

Met Ala Asn Lys His Leu Ser Leu Ser Leu Phe Leu Val Leu Leu Gly
1               5               10              15


Leu Ser Ala Ser Leu Ala Ser Gly Lys Asp Asn Val Ala Asp Val Val
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Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val Gln
        35   40   45

Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val Gly
        50   55   60

Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile Asn
65   70   75   80

Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val Ser
                85   90   95

Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr Thr
            100   105   110

Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala Pro
            115   120   125

Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala Glu
    130   135   140

Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln Asp
145   150   155   160

Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe Ala
                165   170   175

His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val Ala
            180   185   190

Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile Ser
            195   200   205

Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser Asn
    210   215   220

Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys Thr
225   230   235   240

Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro Gly
                245   250   255

34

```
Ser Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala Ser
            260             265             270

Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys Lys
            275             280             285

Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe Ser
            290             295             300

Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile Leu
305             310             315             320

Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp Arg
            325             330             335

Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile Ser
            340             345             350

Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile Thr
            355             360             365

Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser Lys
            370             375             380

Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr Glu
385             390             395             400

Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile Glu
            405             410             415

Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr Gly
            420             425             430

Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe Lys
            435             440             445

Ser Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly Tyr
            450             455             460

Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val Val
465             470             475             480

Ala Ser Leu Val Pro Ala Ala
            485
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35

<210> 22
<211> 1803
<212> DNA
<213> Exophiala spinifera

<220>
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<222> (1)..(1800)
<223>

<400> 22
atg gca ctt gca ccg agc tac atc aat ccc cca aac gtc gcc tcc cca   48
Met Ala Leu Ala Pro Ser Tyr Ile Asn Pro Pro Asn Val Ala Ser Pro
1   5   10   15

gca ggg tat tct cac gtc ggc gta ggc cca gac gga ggg agg tat gtg   96
Ala Gly Tyr Ser His Val Gly Val Gly Pro Asp Gly Gly Arg Tyr Val
                20   25   30

aca ata gct gga cag att gga caa gac gct tcg ggc gtg aca gac cct   144
Thr Ile Ala Gly Gln Ile Gly Gln Asp Ala Ser Gly Val Thr Asp Pro
            35   40   45

gcc tac gag aaa cag gtt gcc caa gca ttc gcc aat ctg cga gct tgc   192
Ala Tyr Glu Lys Gln Val Ala Gln Ala Phe Ala Asn Leu Arg Ala Cys
        50   55   60

ctt gct gca gtt gga gcc act tca aac gac gtc acc aag ctc aat tac   240
Leu Ala Ala Val Gly Ala Thr Ser Asn Asp Val Thr Lys Leu Asn Tyr
65   70   75   80

tac atc gtc gac tac gcc ccg agc aaa ctc acc gca att gga gat ggg   288
Tyr Ile Val Asp Tyr Ala Pro Ser Lys Leu Thr Ala Ile Gly Asp Gly
                85   90   95

ctg aag gct acc ttt gcc ctt gac agg ctc cct cct tgc acg ctg gtg   336
Leu Lys Ala Thr Phe Ala Leu Asp Arg Leu Pro Pro Cys Thr Leu Val
                100   105   110

cca gtg tcg gcc ttg tct tca cct gaa tac ctc ttt gag gtt gat gcc   384
Pro Val Ser Ala Leu Ser Ser Pro Glu Tyr Leu Phe Glu Val Asp Ala
                115   120   125

acg gcg ctg gtg ccg gga cac acg acc cca gac aac gtt gcg gac gtg   432
Thr Ala Leu Val Pro Gly His Thr Thr Pro Asp Asn Val Ala Asp Val
        130   135   140

gta gtg gtg ggc gct ggc ttg agc ggt ttg gag acg gca cgc aaa gtc   480
Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val
145   150   155   160

cag gcc gcc ggt ctg tcc tgc ctc gtt ctt gag gcg atg gat cgt gta   528
Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val
                165   170   175

ggg gga aag act ctg agc gta caa tcg ggt ccc ggc agg acg act atc   576
Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile
                180   185   190

36

```
aac gac ctc ggc gct gcg tgg atc aat gac agc aac caa agc gaa gta        624
Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val
        195                 200                 205

tcc aga ttg ttt gaa aga ttt cat ttg gag ggc gag ctc cag agg acg        672
Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr
        210                 215                 220

act gga aat tca atc cat caa gca caa gac ggt aca acc act aca gct        720
Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala
225                 230                 235                 240

cct tat ggt gac tcc ttg ctg agc gag gag gtt gca agt gca ctt gcg        768
Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala
                    245                 250                 255

gaa ctc ctc ccc gta tgg tct cag ctg atc gaa gag cat agc ctt caa        816
Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln
                260                 265                 270

gac ctc aag gcg agc cct cag gcg aag cgg ctc gac agt gtg agc ttc        864
Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe
            275                 280                 285

gcg cac tac tgt gag aag gaa cta aac ttg cct gct gtt ctc ggc gta        912
Ala His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val
        290                 295                 300

gca aac cag atc aca cgc gct ctg ctc ggt gtg gaa gcc cac gag atc        960
Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile
305                 310                 315                 320

agc atg ctt ttt ctc acc gac tac atc aag agt gcc acc ggt ctc agt       1008
Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser
                325                 330                 335

aat att ttc tcg gac aag aaa gac ggc ggg cag tat atg cga tgc aaa       1056
Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys
            340                 345                 350

aca ggt atg cag tcg att tgc cat gcc atg tca aag gaa ctt gtt cca       1104
Thr Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro
        355                 360                 365

ggc tca gtg cac ctc aac acc ccc gtc gct gaa att gag cag tcg gca       1152
Gly Ser Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala
        370                 375                 380

tcc ggc tgt aca gta cga tcg gcc tcg ggc gcc gtg ttc cga agc aaa       1200
Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys
385                 390                 395                 400

aag gtg gtg gtt tcg tta ccg aca acc ttg tat ccc acc ttg aca ttt       1248
Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe
                405                 410                 415

tca cca cct ctt ccc gcc gag aag caa gca ttg gcg gaa aat tct atc       1296
Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile
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37

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ctg ggc tac tat agc aag ata gtc ttc gta tgg gac aag ccg tgg tgg     1344
Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp
        435                 440                 445

cgc gaa caa ggc ttc tcg ggc gtc ctc caa tcg agc tgt gac ccc atc     1392
Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile
        450                 455                 460

tca ttt gcc aga gat acc agc atc gac gtc gat cga caa tgg tcc att     1440
Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile
465                 470                 475                 480

acc tgt ttc atg gtc gga gac ccg gga cgg aag tgg tcc caa cag tcc     1488
Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser
                485                 490                 495

aag cag gta cga caa aag tct gtc tgg gac caa ctc cgc gca gcc tac     1536
Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr
                500                 505                 510

gag aac gcc ggg gcc caa gtc cca gag ccg gcc aac gtg ctc gaa atc     1584
Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile
            515                 520                 525

gag tgg tcg aag cag cag tat ttc caa gga gct ccg agc gcc gtc tat     1632
Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr
        530                 535                 540

ggg ctg aac gat ctc atc aca ctg ggt tcg gcg ctc aga acg ccg ttc     1680
Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe
545                 550                 555                 560

aag agt gtt cat ttc gtt gga acg gag acg tct tta gtt tgg aaa ggg     1728
Lys Ser Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly
                565                 570                 575

tat atg gaa ggg gcc ata cga tcg ggt caa cga ggt gct gca gaa gtt     1776
Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val
                580                 585                 590

gtg gct agc ctg gtg cca gca gca tag                                 1803
Val Ala Ser Leu Val Pro Ala Ala
                595                 600
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Met Ala Leu Ala Pro Ser Tyr Ile Asn Pro Pro Asn Val Ala Ser Pro
1               5                   10                  15


Ala Gly Tyr Ser His Val Gly Val Gly Pro Asp Gly Gly Arg Tyr Val
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38

20   25   30

Thr Ile Ala Gly Gln Ile Gly Gln Asp Ala Ser Gly Val Thr Asp Pro
        35   40   45

Ala Tyr Glu Lys Gln Val Ala Gln Ala Phe Ala Asn Leu Arg Ala Cys
        50   55   60

Leu Ala Ala Val Gly Ala Thr Ser Asn Asp Val Thr Lys Leu Asn Tyr
65   70   75   80

Tyr Ile Val Asp Tyr Ala Pro Ser Lys Leu Thr Ala Ile Gly Asp Gly
                85   90   95

Leu Lys Ala Thr Phe Ala Leu Asp Arg Leu Pro Pro Cys Thr Leu Val
                100   105   110

Pro Val Ser Ala Leu Ser Ser Pro Glu Tyr Leu Phe Glu Val Asp Ala
            115   120   125

Thr Ala Leu Val Pro Gly His Thr Thr Pro Asp Asn Val Ala Asp Val
    130   135   140

Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val
145   150   155   160

Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val
                165   170   175

Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile
            180   185   190

Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val
            195   200   205

Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr
    210   215   220

Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala
225   230   235   240

Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala
                245   250   255

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Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln
            260             265             270

Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe
            275             280             285

Ala His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val
    290             295             300

Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile
305             310             315             320

Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser
            325             330             335

Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys
            340             345             350

Thr Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro
            355             360             365

Gly Ser Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala
    370             375             380

Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys
385             390             395             400

Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe
            405             410             415

Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile
            420             425             430

Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp
            435             440             445

Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile
    450             455             460

Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile
465             470             475             480

Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser
            485             490             495
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40

Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr
        500   505   510

Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile
        515   520   525

Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr
        530   535   540

Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe
545   550   555   560

Lys Ser Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly
                565   570   575

Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val
        580   585   590

Val Ala Ser Leu Val Pro Ala Ala
        595   600

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Met Ala Asn Lys His Leu Ser Leu Ser Leu Phe Leu Val Leu Leu Gly
1               5                  10                  15

ctc tcc gcc tcc ctc gcc agc ggc gct cct act gtc aag att gat gct      96
Leu Ser Ala Ser Leu Ala Ser Gly Ala Pro Thr Val Lys Ile Asp Ala
                20                  25                  30

ggg atg gtg gtc ggc acg act act act gtc ccc ggc acc act gcg acc     144
Gly Met Val Val Gly Thr Thr Thr Thr Val Pro Gly Thr Thr Ala Thr
            35                  40                  45

gtc agc gag ttc ttg ggc gtt cct ttt gcc gcc tct ccg aca cga ttt     192
Val Ser Glu Phe Leu Gly Val Pro Phe Ala Ala Ser Pro Thr Arg Phe
        50                  55                  60

gcg cct cct act cgt ccc gtg cct tgg tca acg cct ttg caa gcc act     240
Ala Pro Pro Thr Arg Pro Val Pro Trp Ser Thr Pro Leu Gln Ala Thr
65                  70                  75                  80

gca tat ggt cca gca tgc cct caa caa ttc aat tac ccc gaa gaa ctc     288
Ala Tyr Gly Pro Ala Cys Pro Gln Gln Phe Asn Tyr Pro Glu Glu Leu
                85                  90                  95

cgt gag att acg atg gcc tgg ttc aat aca ccg ccc ccg tca gct ggt     336
Arg Glu Ile Thr Met Ala Trp Phe Asn Thr Pro Pro Pro Ser Ala Gly
                100                 105                 110

gaa agt gag gac tgc ctg aac ctc aac atc tac gtc cca gga act gag     384
Glu Ser Glu Asp Cys Leu Asn Leu Asn Ile Tyr Val Pro Gly Thr Glu
            115                 120                 125

aac aca aac aaa gcc gtc atg gtt tgg ata tac ggt gga gcg ctg gaa     432
Asn Thr Asn Lys Ala Val Met Val Trp Ile Tyr Gly Gly Ala Leu Glu
        130                 135                 140

tat ggt tgg aat tca ttc cac ctt tac gac ggg gct agt ttc gca gcc     480
Tyr Gly Trp Asn Ser Phe His Leu Tyr Asp Gly Ala Ser Phe Ala Ala
145                 150                 155                 160

aat cag gat gtc atc gcc gtg acc atc aac tac aga acg aac att ctg     528
Asn Gln Asp Val Ile Ala Val Thr Ile Asn Tyr Arg Thr Asn Ile Leu
                165                 170                 175

ggg ttc cct gct gcc cct cag ctt cca ata aca cag cga aat ctg ggg     576
Gly Phe Pro Ala Ala Pro Gln Leu Pro Ile Thr Gln Arg Asn Leu Gly
                180                 185                 190

ttc cta gac caa agg ttt gct ttg gat tgg gta cag cgg aac atc gca     624
Phe Leu Asp Gln Arg Phe Ala Leu Asp Trp Val Gln Arg Asn Ile Ala
            195                 200                 205
```

42

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gcc ttt ggc ggt gat cct cga aag gtc aca ata ttt ggg cag agt gcg        672
Ala Phe Gly Gly Asp Pro Arg Lys Val Thr Ile Phe Gly Gln Ser Ala
    210             215             220

ggg ggc aga agt gtc gac gtc ctc ttg acg tct atg cca cac aac cca        720
Gly Gly Arg Ser Val Asp Val Leu Leu Thr Ser Met Pro His Asn Pro
225             230             235             240

ccc ttc cga gca gca atc atg gag tcc ggt gtg gct aac tac aac ttc        768
Pro Phe Arg Ala Ala Ile Met Glu Ser Gly Val Ala Asn Tyr Asn Phe
                245             250             255

ccc aag gga gat ttg tcc gaa cct tgg aac acc act gtt caa gct ctc        816
Pro Lys Gly Asp Leu Ser Glu Pro Trp Asn Thr Thr Val Gln Ala Leu
                260             265             270

aac tgt acc acc agt atc gac atc ttg agt tgt atg aga aga gtc gat        864
Asn Cys Thr Thr Ser Ile Asp Ile Leu Ser Cys Met Arg Arg Val Asp
            275             280             285

ctc gcc act ctg atg aac acg atc gag caa ctc gga ctt ggg ttt gag        912
Leu Ala Thr Leu Met Asn Thr Ile Glu Gln Leu Gly Leu Gly Phe Glu
    290             295             300

tac acg ttg gac aac gta acg gct gtg tac cgt tct gaa acg gct cgc        960
Tyr Thr Leu Asp Asn Val Thr Ala Val Tyr Arg Ser Glu Thr Ala Arg
305             310             315             320

acg act ggt gac att gct cgt gta cct gtt ctc gtc ggg acg gtg gcc       1008
Thr Thr Gly Asp Ile Ala Arg Val Pro Val Leu Val Gly Thr Val Ala
                325             330             335

aac gac gga ctt ctc ttt gtc ctc ggg gag aat gac acc caa gca tat       1056
Asn Asp Gly Leu Leu Phe Val Leu Gly Glu Asn Asp Thr Gln Ala Tyr
                340             345             350

ctc gag gag gca atc ccg aat cag ccc gac ctt tac cag act ctc ctt       1104
Leu Glu Glu Ala Ile Pro Asn Gln Pro Asp Leu Tyr Gln Thr Leu Leu
            355             360             365

gga gca tat ccc att gga tcc cca ggg atc gga tcg cct caa gat cag       1152
Gly Ala Tyr Pro Ile Gly Ser Pro Gly Ile Gly Ser Pro Gln Asp Gln
    370             375             380

att gcc gcc att gag acc gag gta aga ttc cag tgt cct tct gcc atc       1200
Ile Ala Ala Ile Glu Thr Glu Val Arg Phe Gln Cys Pro Ser Ala Ile
385             390             395             400

gtg gct cag gac tcc cgg aat cgg ggt atc cct tct tgg cgc tac tac       1248
Val Ala Gln Asp Ser Arg Asn Arg Gly Ile Pro Ser Trp Arg Tyr Tyr
                405             410             415

tac aat gcg acc ttt gag aat ctg gag ctt ttc cct ggg tcc gaa gtg       1296
Tyr Asn Ala Thr Phe Glu Asn Leu Glu Leu Phe Pro Gly Ser Glu Val
                420             425             430

tac cac agc tct gaa gtc ggg atg gtg ttt ggc acg tat cct gtc gca       1344
Tyr His Ser Ser Glu Val Gly Met Val Phe Gly Thr Tyr Pro Val Ala
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43

agt gcg acc gcc ttg gag gcc cag acg agc aaa tac atg cag ggt gcc   1392
Ser Ala Thr Ala Leu Glu Ala Gln Thr Ser Lys Tyr Met Gln Gly Ala
    450   455   460

tgg gcg gcc ttt gcc aaa aac ccc atg aat ggg cct ggg tgg aaa caa   1440
Trp Ala Ala Phe Ala Lys Asn Pro Met Asn Gly Pro Gly Trp Lys Gln
465   470   475   480

gtg ccg aat gtc gcg gcg ctt ggc tca cca ggc aaa gcc atc cag gtt   1488
Val Pro Asn Val Ala Ala Leu Gly Ser Pro Gly Lys Ala Ile Gln Val
                485   490   495

gac gtc tct cca gcg aca ata gac caa cga tgt gcc ttg tac acg cgt   1536
Asp Val Ser Pro Ala Thr Ile Asp Gln Arg Cys Ala Leu Tyr Thr Arg
            500   505   510

tat tat act gag ttg ggc aca atc gcg ccg agg aca ttt ggc gga ggc   1584
Tyr Tyr Thr Glu Leu Gly Thr Ile Ala Pro Arg Thr Phe Gly Gly Gly
            515   520   525

agc ggc gga ggc agc ggc gga ggc agc aaa gac aac gtt gcg gac gtg   1632
Ser Gly Gly Gly Ser Gly Gly Gly Ser Lys Asp Asn Val Ala Asp Val
    530   535   540

gta gtg gtg ggc gct ggc ttg agc ggt ttg gag acg gca cgc aaa gtc   1680
Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val
545   550   555   560

cag gcc gcc ggt ctg tcc tgc ctc gtt ctt gag gcg atg gat cgt gta   1728
Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val
                565   570   575

ggg gga aag act ctg agc gta caa tcg ggt ccc ggc agg acg act atc   1776
Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile
            580   585   590

aac gac ctc ggc gct gcg tgg atc aat gac agc aac caa agc gaa gta   1824
Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val
            595   600   605

tcc aga ttg ttt gaa aga ttt cat ttg gag ggc gag ctc cag agg acg   1872
Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr
    610   615   620

act gga aat tca atc cat caa gca caa gac ggt aca acc act aca gct   1920
Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala
625   630   635   640

cct tat ggt gac tcc ttg ctg agc gag gag gtt gca agt gca ctt gcg   1968
Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala
                645   650   655

gaa ctc ctc ccc gta tgg tct cag ctg atc gaa gag cat agc ctt caa   2016
Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln
            660   665   670

gac ctc aag gcg agc cct cag gcg aag cgg ctc gac agt gtg agc ttc   2064

44

```
Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe
    675                 680                 685

gcg cac tac tgt gag aag gaa cta aac ttg cct gct gtt ctc ggc gta      2112
Ala His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val
    690                 695                 700

gca aac cag atc aca cgc gct ctg ctc ggt gtg gaa gcc cac gag atc      2160
Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile
705                 710                 715                 720

agc atg ctt ttt ctc acc gac tac atc aag agt gcc acc ggt ctc agt      2208
Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser
                725                 730                 735

aat att ttc tcg gac aag aaa gac ggc ggg cag tat atg cga tgc aaa      2256
Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys
                740                 745                 750

aca ggt atg cag tcg att tgc cat gcc atg tca aag gaa ctt gtt cca      2304
Thr Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro
                755                 760                 765

ggc tca gtg cac ctc aac acc ccc gtc gct gaa att gag cag tcg gca      2352
Gly Ser Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala
                770                 775                 780

tcc ggc tgt aca gta cga tcg gcc tcg ggc gcc gtg ttc cga agc aaa      2400
Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys
785                 790                 795                 800

aag gtg gtg gtt tcg tta ccg aca acc ttg tat ccc acc ttg aca ttt      2448
Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe
                805                 810                 815

tca cca cct ctt ccc gcc gag aag caa gca ttg gcg gaa aat tct atc      2496
Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile
                820                 825                 830

ctg ggc tac tat agc aag ata gtc ttc gta tgg gac aag ccg tgg tgg      2544
Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp
                835                 840                 845

cgc gaa caa ggc ttc tcg ggc gtc ctc caa tcg agc tgt gac ccc atc      2592
Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile
                850                 855                 860

tca ttt gcc aga gat acc agc atc gac gtc gat cga caa tgg tcc att      2640
Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile
865                 870                 875                 880

acc tgt ttc atg gtc gga gac ccg gga cgg aag tgg tcc caa cag tcc      2688
Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser
                885                 890                 895

aag cag gta cga caa aag tct gtc tgg gac caa ctc cgc gca gcc tac      2736
Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr
                900                 905                 910
```

45

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gag aac gcc ggg gcc caa gtc cca gag ccg gcc aac gtg ctc gaa atc      2784
Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile
        915                 920                 925

gag tgg tcg aag cag cag tat ttc caa gga gct ccg agc gcc gtc tat      2832
Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr
        930                 935                 940

ggg ctg aac gat ctc atc aca ctg ggt tcg gcg ctc aga acg ccg ttc      2880
Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe
945                 950                 955                 960

aag agt gtt cat ttc gtt gga acg gag acg tct tta gtt tgg aaa ggg      2928
Lys Ser Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly
                965                 970                 975

tat atg gaa ggg gcc ata cga tcg ggt caa cga ggt gct gca gaa gtt      2976
Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val
                980                 985                 990

gtg gct agc ctg gtg cca gca gca  tag                                 3003
Val Ala Ser Leu Val Pro Ala Ala
        995                 1000


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<223>   extra lysine

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Met Ala Asn Lys His Leu Ser Leu Ser Leu Phe Leu Val Leu Leu Gly
1               5                   10                  15
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46

Leu Ser Ala Ser Leu Ala Ser Gly Ala Pro Thr Val Lys Ile Asp Ala
            20   25   30

Gly Met Val Val Gly Thr Thr Thr Thr Val Pro Gly Thr Thr Ala Thr
            35   40   45

Val Ser Glu Phe Leu Gly Val Pro Phe Ala Ala Ser Pro Thr Arg Phe
    50   55   60

Ala Pro Pro Thr Arg Pro Val Pro Trp Ser Thr Pro Leu Gln Ala Thr
65   70   75   80

Ala Tyr Gly Pro Ala Cys Pro Gln Gln Phe Asn Tyr Pro Glu Glu Leu
                85   90   95

Arg Glu Ile Thr Met Ala Trp Phe Asn Thr Pro Pro Pro Ser Ala Gly
            100   105   110

Glu Ser Glu Asp Cys Leu Asn Leu Asn Ile Tyr Val Pro Gly Thr Glu
    115   120   125

Asn Thr Asn Lys Ala Val Met Val Trp Ile Tyr Gly Gly Ala Leu Glu
    130   135   140

Tyr Gly Trp Asn Ser Phe His Leu Tyr Asp Gly Ala Ser Phe Ala Ala
145   150   155   160

Asn Gln Asp Val Ile Ala Val Thr Ile Asn Tyr Arg Thr Asn Ile Leu
            165   170   175

Gly Phe Pro Ala Ala Pro Gln Leu Pro Ile Thr Gln Arg Asn Leu Gly
            180   185   190

Phe Leu Asp Gln Arg Phe Ala Leu Asp Trp Val Gln Arg Asn Ile Ala
    195   200   205

Ala Phe Gly Gly Asp Pro Arg Lys Val Thr Ile Phe Gly Gln Ser Ala
    210   215   220

Gly Gly Arg Ser Val Asp Val Leu Leu Thr Ser Met Pro His Asn Pro
225   230   235   240

Pro Phe Arg Ala Ala Ile Met Glu Ser Gly Val Ala Asn Tyr Asn Phe
            245   250   255

47

```
Pro Lys Gly Asp Leu Ser Glu Pro Trp Asn Thr Thr Val Gln Ala Leu
        260                 265                 270

Asn Cys Thr Thr Ser Ile Asp Ile Leu Ser Cys Met Arg Arg Val Asp
        275                 280                 285

Leu Ala Thr Leu Met Asn Thr Ile Glu Gln Leu Gly Leu Gly Phe Glu
        290                 295                 300

Tyr Thr Leu Asp Asn Val Thr Ala Val Tyr Arg Ser Glu Thr Ala Arg
305                 310                 315                 320

Thr Thr Gly Asp Ile Ala Arg Val Pro Val Leu Val Gly Thr Val Ala
                325                 330                 335

Asn Asp Gly Leu Leu Phe Val Leu Gly Glu Asn Asp Thr Gln Ala Tyr
            340                 345                 350

Leu Glu Glu Ala Ile Pro Asn Gln Pro Asp Leu Tyr Gln Thr Leu Leu
        355                 360                 365

Gly Ala Tyr Pro Ile Gly Ser Pro Gly Ile Gly Ser Pro Gln Asp Gln
    370                 375                 380

Ile Ala Ala Ile Glu Thr Glu Val Arg Phe Gln Cys Pro Ser Ala Ile
385                 390                 395                 400

Val Ala Gln Asp Ser Arg Asn Arg Gly Ile Pro Ser Trp Arg Tyr Tyr
                405                 410                 415

Tyr Asn Ala Thr Phe Glu Asn Leu Glu Leu Phe Pro Gly Ser Glu Val
            420                 425                 430

Tyr His Ser Ser Glu Val Gly Met Val Phe Gly Thr Tyr Pro Val Ala
        435                 440                 445

Ser Ala Thr Ala Leu Glu Ala Gln Thr Ser Lys Tyr Met Gln Gly Ala
    450                 455                 460

Trp Ala Ala Phe Ala Lys Asn Pro Met Asn Gly Pro Gly Trp Lys Gln
465                 470                 475                 480

Val Pro Asn Val Ala Ala Leu Gly Ser Pro Gly Lys Ala Ile Gln Val
                485                 490                 495
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48

Asp Val Ser Pro Ala Thr Ile Asp Gln Arg Cys Ala Leu Tyr Thr Arg
        500   505   510

Tyr Tyr Thr Glu Leu Gly Thr Ile Ala Pro Arg Thr Phe Gly Gly Gly
        515   520   525

Ser Gly Gly Gly Ser Gly Gly Gly Ser Lys Asp Asn Val Ala Asp Val
    530   535   540

Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val
545   550   555   560

Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val
            565   570   575

Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile
            580   585   590

Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val
        595   600   605

Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr
    610   615   620

Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala
625   630   635   640

Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala
            645   650   655

Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln
            660   665   670

Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe
        675   680   685

Ala His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val
    690   695   700

Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile
705   710   715   720

Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser

49

Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys
740 745 750

Thr Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro
755 760 765

Gly Ser Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala
770 775 780

Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys
785 790 795 800

Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe
805 810 815

Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile
820 825 830

Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp
835 840 845

Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile
850 855 860

Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile
865 870 875 880

Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser
885 890 895

Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr
900 905 910

Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile
915 920 925

Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr
930 935 940

Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe
945 950 955 960

Lys Ser Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly
              965   970   975

Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val
              980   985   990

Val Ala Ser Leu Val Pro Ala Ala
              995   1000

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       er:K:trAPAO

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<223> BEST1 mature

<220>
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<223> spacer sequence

<220>
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<222> (1585)..(2973)
<223> K:trAPAO

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<223> Extra lysine

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atg gcc aac aag cac ctg agc ctc tcc ctc ttc ctc gtg ctc ctc ggc   48
Met Ala Asn Lys His Leu Ser Leu Ser Leu Phe Leu Val Leu Leu Gly

51

```
ctc tcc gcc tcc ctc gcc agc ggc acg gat ttt ccg gtc cgc agg acc    96
Leu Ser Ala Ser Leu Ala Ser Gly Thr Asp Phe Pro Val Arg Arg Thr
            -5              -1  1              5

gat ctg ggc cag gtt cag gga ctg gcc ggg gac gtg atg agc ttt cgc    144
Asp Leu Gly Gln Val Gln Gly Leu Ala Gly Asp Val Met Ser Phe Arg
    10              15                  20

gga ata ccc tat gca gcg ccg ccg gtg ggc ggg ctg cgt tgg aag ccg    192
Gly Ile Pro Tyr Ala Ala Pro Pro Val Gly Gly Leu Arg Trp Lys Pro
25              30              35                  40

ccc caa cac gcc cgg ccc tgg gcg ggc gtt cgc ccc gcc acc caa ttt    240
Pro Gln His Ala Arg Pro Trp Ala Gly Val Arg Pro Ala Thr Gln Phe
                45              50                  55

ggc tcc gac tgc ttc ggc gcg gcc tat ctt cgc aaa ggc agc ctc gcc    288
Gly Ser Asp Cys Phe Gly Ala Ala Tyr Leu Arg Lys Gly Ser Leu Ala
            60              65                  70

ccc ggc gtg agc gag gac tgt ctt tac ctc aac gta tgg gcg ccg tca    336
Pro Gly Val Ser Glu Asp Cys Leu Tyr Leu Asn Val Trp Ala Pro Ser
        75              80                  85

ggc gct aaa ccc ggc cag tac ccc gtc atg gtc tgg gtc tac ggc ggc    384
Gly Ala Lys Pro Gly Gln Tyr Pro Val Met Val Trp Val Tyr Gly Gly
    90              95                  100

ggc ttc gcc ggc ggc acg gcc gcc atg ccc tac tac gac ggc gag gcg    432
Gly Phe Ala Gly Gly Thr Ala Ala Met Pro Tyr Tyr Asp Gly Glu Ala
105                 110             115                 120

ctt gcg cga cag ggc gtc gtc gtg gtg acg ttt aac tat cgg acg aac    480
Leu Ala Arg Gln Gly Val Val Val Val Thr Phe Asn Tyr Arg Thr Asn
                125             130                 135

atc ctg ggc ttt ttc gcc cat cct ggt ctc tcg cgc gag agc ccc acc    528
Ile Leu Gly Phe Phe Ala His Pro Gly Leu Ser Arg Glu Ser Pro Thr
            140             145                 150

gga act tcg ggc aac tac ggc cta ctc gac att ctc gcc gct ctt cgg    576
Gly Thr Ser Gly Asn Tyr Gly Leu Leu Asp Ile Leu Ala Ala Leu Arg
            155                 160                 165

tgg gtg cag agc aac gcc cgc gcc ttc gga ggg gac ccc ggc cga gtg    624
Trp Val Gln Ser Asn Ala Arg Ala Phe Gly Gly Asp Pro Gly Arg Val
    170                 175                 180

acg gtc ttt ggt gaa tcg gcc gga gcg agc gcg atc gga ctt ctg ctc    672
Thr Val Phe Gly Glu Ser Ala Gly Ala Ser Ala Ile Gly Leu Leu Leu
185                 190             195                 200

acc tcg ccg ctg agc aag ggt ctc ttc cgt ggc gct atc ctc gaa agt    720
Thr Ser Pro Leu Ser Lys Gly Leu Phe Arg Gly Ala Ile Leu Glu Ser
                205             210                 215

cca ggg ctg acg cga ccg ctc gcg acg ctc gcc gac agc gcc gcc tcg    768
```

52

```
Pro Gly Leu Thr Arg Pro Leu Ala Thr Leu Ala Asp Ser Ala Ala Ser
            220             225             230

ggc gag cgc ctc gac gcc gat ctt tcg cga ctg cgc tcg acc gac cca      816
Gly Glu Arg Leu Asp Ala Asp Leu Ser Arg Leu Arg Ser Thr Asp Pro
            235             240             245

gcc acc ctg atg gcg cgc gcc gac gcg gcc cgc ccg gca tcg cgg gac      864
Ala Thr Leu Met Ala Arg Ala Asp Ala Ala Arg Pro Ala Ser Arg Asp
            250             255             260

ctg cgc agg ccg cgt ccg acc gga ccg atc gtc gat ggc cat gtg ctg      912
Leu Arg Arg Pro Arg Pro Thr Gly Pro Ile Val Asp Gly His Val Leu
265             270             275             280

ccg cag acc gac agc gcg gcg atc gcg gcg ggg cag ctg gcg ccg gtt      960
Pro Gln Thr Asp Ser Ala Ala Ile Ala Ala Gly Gln Leu Ala Pro Val
                285             290             295

cgg gtc ctg atc gga acc aat gcc gac gaa ggc cgc gcc ttc ctc ggg     1008
Arg Val Leu Ile Gly Thr Asn Ala Asp Glu Gly Arg Ala Phe Leu Gly
                300             305             310

cgc gcg ccg atg gag acg cca gcg gac tac caa gcc tat ctg gag gcg     1056
Arg Ala Pro Met Glu Thr Pro Ala Asp Tyr Gln Ala Tyr Leu Glu Ala
            315             320             325

cag ttt ggc gac caa gcc gcc gcc gtg gcg gcg tgc tat ccc ctc gac     1104
Gln Phe Gly Asp Gln Ala Ala Ala Val Ala Ala Cys Tyr Pro Leu Asp
            330             335             340

ggc cgg gcc acg ccc aag gaa atg gtc gcg cgc atc ttc ggc gac aat     1152
Gly Arg Ala Thr Pro Lys Glu Met Val Ala Arg Ile Phe Gly Asp Asn
345             350             355             360

cag ttc aat cgg ggg gtc tcg gcc ttc tcg gaa gcg ctt gtg cgc cag     1200
Gln Phe Asn Arg Gly Val Ser Ala Phe Ser Glu Ala Leu Val Arg Gln
                365             370             375

ggc gcg ccc gtg tgg cgt tat cag ttc aac ggt aat acc gag ggt gga     1248
Gly Ala Pro Val Trp Arg Tyr Gln Phe Asn Gly Asn Thr Glu Gly Gly
                380             385             390

aga gcg ccg gct acc cac gga gcc gaa att ccc tac gtt ttc ggg gtg     1296
Arg Ala Pro Ala Thr His Gly Ala Glu Ile Pro Tyr Val Phe Gly Val
                395             400             405

ttc aag ctc gac gag ttg ggt ctg ttc gat tgg ccg ccc gag ggg ccc     1344
Phe Lys Leu Asp Glu Leu Gly Leu Phe Asp Trp Pro Pro Glu Gly Pro
            410             415             420

acg ccc gcc gac cgt gcg ctg ggc caa ctg atg tcc tcc gcc tgg gtc     1392
Thr Pro Ala Asp Arg Ala Leu Gly Gln Leu Met Ser Ser Ala Trp Val
425             430             435             440

cgg ttc gcc aag aat ggc gac ccc gcc ggg gac gcc ctt acc tgg cct     1440
Arg Phe Ala Lys Asn Gly Asp Pro Ala Gly Asp Ala Leu Thr Trp Pro
                445             450             455

                                      53
```

```
gcc tat tct acg ggc aag tcg acc atg aca ttc ggt ccc gag ggc cgc    1488
Ala Tyr Ser Thr Gly Lys Ser Thr Met Thr Phe Gly Pro Glu Gly Arg
            460             465                 470

gcg gcg gtg gtg tcg ccc gga cct tcc atc ccc cct tgc gcg gat ggc    1536
Ala Ala Val Val Ser Pro Gly Pro Ser Ile Pro Pro Cys Ala Asp Gly
            475             480                 485

gcc aag gcg ggg ggc gga ggc agc ggc gga ggc agc ggc gga ggc agc    1584
Ala Lys Ala Gly Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser
        490             495                 500

aaa gac aac gtt gcg gac gtg gta gtg gtg ggc gct ggc ttg agc ggt    1632
Lys Asp Asn Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly
505             510                 515                 520

ttg gag acg gca cgc aaa gtc cag gcc gcc ggt ctg tcc tgc ctc gtt    1680
Leu Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val
                525             530                 535

ctt gag gcg atg gat cgt gta ggg gga aag act ctg agc gta caa tcg    1728
Leu Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser
            540             545                 550

ggt ccc ggc agg acg act atc aac gac ctc ggc gct gcg tgg atc aat    1776
Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn
            555             560                 565

gac agc aac caa agc gaa gta tcc aga ttg ttt gaa aga ttt cat ttg    1824
Asp Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu
        570             575                 580

gag ggc gag ctc cag agg acg act gga aat tca atc cat caa gca caa    1872
Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln
585             590                 595                 600

gac ggt aca acc act aca gct cct tat ggt gac tcc ttg ctg agc gag    1920
Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu
                605             610                 615

gag gtt gca agt gca ctt gcg gaa ctc ctc ccc gta tgg tct cag ctg    1968
Glu Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu
            620             625                 630

atc gaa gag cat agc ctt caa gac ctc aag gcg agc cct cag gcg aag    2016
Ile Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys
            635             640                 645

cgg ctc gac agt gtg agc ttc gcg cac tac tgt gag aag gaa cta aac    2064
Arg Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn
        650             655                 660

ttg cct gct gtt ctc ggc gta gca aac cag atc aca cgc gct ctg ctc    2112
Leu Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu
665             670                 675                 680

ggt gtg gaa gcc cac gag atc agc atg ctt ttt ctc acc gac tac atc    2160
Gly Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile
            685             690                 695
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54

```
aag agt gcc acc ggt ctc agt aat att ttc tcg gac aag aaa gac ggc        2208
Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly
            700                 705                 710

ggg cag tat atg cga tgc aaa aca ggt atg cag tcg att tgc cat gcc        2256
Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala
            715                 720                 725

atg tca aag gaa ctt gtt cca ggc tca gtg cac ctc aac acc ccc gtc        2304
Met Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val
            730                 735                 740

gct gaa att gag cag tcg gca tcc ggc tgt aca gta cga tcg gcc tcg        2352
Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser
745                 750                 755                 760

ggc gcc gtg ttc cga agc aaa aag gtg gtg gtt tcg tta ccg aca acc        2400
Gly Ala Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr
                765                 770                 775

ttg tat ccc acc ttg aca ttt tca cca cct ctt ccc gcc gag aag caa        2448
Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln
                780                 785                 790

gca ttg gcg gaa aat tct atc ctg ggc tac tat agc aag ata gtc ttc        2496
Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe
                795                 800                 805

gta tgg gac aag ccg tgg tgg cgc gaa caa ggc ttc tcg ggc gtc ctc        2544
Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu
        810                 815                 820

caa tcg agc tgt gac ccc atc tca ttt gcc aga gat acc agc atc gac        2592
Gln Ser Ser Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp
825                 830                 835                 840

gtc gat cga caa tgg tcc att acc tgt ttc atg gtc gga gac ccg gga        2640
Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly
                845                 850                 855

cgg aag tgg tcc caa cag tcc aag cag gta cga caa aag tct gtc tgg        2688
Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp
                860                 865                 870

gac caa ctc cgc gca gcc tac gag aac gcc ggg gcc caa gtc cca gag        2736
Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu
            875                 880                 885

ccg gcc aac gtg ctc gaa atc gag tgg tcg aag cag cag tat ttc caa        2784
Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln
        890                 895                 900

gga gct ccg agc gcc gtc tat ggg ctg aac gat ctc atc aca ctg ggt        2832
Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly
905                 910                 915                 920

tcg gcg ctc aga acg ccg ttc aag agt gtt cat ttc gtt gga acg gag        2880
Ser Ala Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu
```

55

```
acg tct tta gtt tgg aaa ggg tat atg gaa ggg gcc ata cga tcg ggt    2928
Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly
        940                 945                 950

caa cga ggt gct gca gaa gtt gtg gct agc ctg gtg cca gca gca tag    2976
Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
        955                 960                 965
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<220>
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      er:K:trAPAO

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<223> spacer sequence

<220>
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<222> (1585)..(2973)
<223> K:trAPAO

<220>
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<222> (1585)..(1587)
<223> Extra lysine

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Met Ala Asn Lys His Leu Ser Leu Ser Leu Phe Leu Val Leu Leu Gly
            -20                 -15                 -10


Leu Ser Ala Ser Leu Ala Ser Gly Thr Asp Phe Pro Val Arg Arg Thr
            -5              -1  1               5


Asp Leu Gly Gln Val Gln Gly Leu Ala Gly Asp Val Met Ser Phe Arg
    10                  15                  20


Gly Ile Pro Tyr Ala Ala Pro Pro Val Gly Gly Leu Arg Trp Lys Pro
25                  30                  35                  40


Pro Gln His Ala Arg Pro Trp Ala Gly Val Arg Pro Ala Thr Gln Phe
                45                  50                  55


Gly Ser Asp Cys Phe Gly Ala Ala Tyr Leu Arg Lys Gly Ser Leu Ala
                60                  65                  70
```

56

Pro Gly Val Ser Glu Asp Cys Leu Tyr Leu Asn Val Trp Ala Pro Ser
    75   80   85

Gly Ala Lys Pro Gly Gln Tyr Pro Val Met Val Trp Val Tyr Gly Gly
    90   95   100

Gly Phe Ala Gly Gly Thr Ala Ala Met Pro Tyr Tyr Asp Gly Glu Ala
105   110   115   120

Leu Ala Arg Gln Gly Val Val Val Val Thr Phe Asn Tyr Arg Thr Asn
            125   130   135

Ile Leu Gly Phe Phe Ala His Pro Gly Leu Ser Arg Glu Ser Pro Thr
            140   145   150

Gly Thr Ser Gly Asn Tyr Gly Leu Leu Asp Ile Leu Ala Ala Leu Arg
        155   160   165

Trp Val Gln Ser Asn Ala Arg Ala Phe Gly Gly Asp Pro Gly Arg Val
    170   175   180

Thr Val Phe Gly Glu Ser Ala Gly Ala Ser Ala Ile Gly Leu Leu Leu
185   190   195   200

Thr Ser Pro Leu Ser Lys Gly Leu Phe Arg Gly Ala Ile Leu Glu Ser
                205   210   215

Pro Gly Leu Thr Arg Pro Leu Ala Thr Leu Ala Asp Ser Ala Ala Ser
            220   225   230

Gly Glu Arg Leu Asp Ala Asp Leu Ser Arg Leu Arg Ser Thr Asp Pro
        235   240   245

Ala Thr Leu Met Ala Arg Ala Asp Ala Ala Arg Pro Ala Ser Arg Asp
    250   255   260

Leu Arg Arg Pro Arg Pro Thr Gly Pro Ile Val Asp Gly His Val Leu
265   270   275   280

Pro Gln Thr Asp Ser Ala Ala Ile Ala Ala Gly Gln Leu Ala Pro Val
            285   290   295

Arg Val Leu Ile Gly Thr Asn Ala Asp Glu Gly Arg Ala Phe Leu Gly

57

Arg Ala Pro Met Glu Thr Pro Ala Asp Tyr Gln Ala Tyr Leu Glu Ala
        315   320   325

Gln Phe Gly Asp Gln Ala Ala Ala Val Ala Ala Cys Tyr Pro Leu Asp
        330   335   340

Gly Arg Ala Thr Pro Lys Glu Met Val Ala Arg Ile Phe Gly Asp Asn
345   350   355   360

Gln Phe Asn Arg Gly Val Ser Ala Phe Ser Glu Ala Leu Val Arg Gln
                365   370   375

Gly Ala Pro Val Trp Arg Tyr Gln Phe Asn Gly Asn Thr Glu Gly Gly
            380   385   390

Arg Ala Pro Ala Thr His Gly Ala Glu Ile Pro Tyr Val Phe Gly Val
        395   400   405

Phe Lys Leu Asp Glu Leu Gly Leu Phe Asp Trp Pro Pro Glu Gly Pro
    410   415   420

Thr Pro Ala Asp Arg Ala Leu Gly Gln Leu Met Ser Ser Ala Trp Val
425   430   435   440

Arg Phe Ala Lys Asn Gly Asp Pro Ala Gly Asp Ala Leu Thr Trp Pro
                445   450   455

Ala Tyr Ser Thr Gly Lys Ser Thr Met Thr Phe Gly Pro Glu Gly Arg
            460   465   470

Ala Ala Val Val Ser Pro Gly Pro Ser Ile Pro Pro Cys Ala Asp Gly
        475   480   485

Ala Lys Ala Gly Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser
        490   495   500

Lys Asp Asn Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly
505   510   515   520

Leu Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val
                525   530   535

58

```
Leu Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser
            540              545              550

Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn
            555              560              565

Asp Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu
    570              575              580

Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln
585              590              595              600

Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu
            605              610              615

Glu Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu
            620              625              630

Ile Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys
            635              640              645

Arg Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn
    650              655              660

Leu Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu
665              670              675              680

Gly Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile
            685              690              695

Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly
            700              705              710

Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala
            715              720              725

Met Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val
    730              735              740

Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser
745              750              755              760

Gly Ala Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr
            765              770              775
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Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln
        780   785   790

Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe
        795   800   805

Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu
        810   815   820

Gln Ser Ser Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp
825   830   835   840

Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly
        845   850   855

Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp
        860   865   870

Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu
        875   880   885

Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln
        890   895   900

Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly
905   910   915   920

Ser Ala Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu
            925   930   935

Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly
            940   945   950

Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
        955   960   965

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60

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<223>

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<223> esp1 mat

<220>
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<222> (2191)..(2226)
<223> spacer sequence

<220>
<221> misc_feature
<222> (2227)..(3615)
<223> K:trAPAO

<220>
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<222> (2227)..(2229)
<223> extra lysine

<400> 28

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atg tcc cct ata cta  ggt tat tgg aaa att  aag ggc ctt gtg caa          45
Met Ser Pro Ile Leu  Gly Tyr Trp Lys Ile  Lys Gly Leu Val Gln
            -225               -220               -215


ccc act cga ctt ctt  ttg gaa tat ctt gaa  gaa aaa tat gaa gag          90
Pro Thr Arg Leu Leu  Leu Glu Tyr Leu Glu  Glu Lys Tyr Glu Glu
            -210               -205               -200


cat ttg tat gag cgc  gat gaa ggt gat aaa  tgg cga aac aaa aag         135
His Leu Tyr Glu Arg  Asp Glu Gly Asp Lys  Trp Arg Asn Lys Lys
            -195               -190               -185


ttt gaa ttg ggt ttg  gag ttt ccc aat ctt  cct tat tat att gat        180
Phe Glu Leu Gly Leu  Glu Phe Pro Asn Leu  Pro Tyr Tyr Ile Asp
            -180               -175               -170


ggt gat gtt aaa tta  aca cag tct atg gcc  atc ata cgt tat ata        225
Gly Asp Val Lys Leu  Thr Gln Ser Met Ala  Ile Ile Arg Tyr Ile
            -165               -160               -155


gct gac aag cac aac  atg ttg ggt ggt tgt  cca aaa gag cgt gca        270
Ala Asp Lys His Asn  Met Leu Gly Gly Cys  Pro Lys Glu Arg Ala
            -150               -145               -140


gag att tca atg ctt  gaa gga gcg gtt ttg  gat att aga tac ggt        315
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61

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Glu Ile Ser Met Leu  Glu Gly Ala Val Leu  Asp Ile Arg Tyr Gly
              -135                -130                     -125

gtt tcg aga att gca  tat agt aaa gac ttt  gaa act ctc aaa gtt         360
Val Ser Arg Ile Ala  Tyr Ser Lys Asp Phe  Glu Thr Leu Lys Val
              -120                -115                     -110

gat ttt ctt agc aag  cta cct gaa atg ctg  aaa atg ttc gaa gat cgt     408
Asp Phe Leu Ser Lys  Leu Pro Glu Met Leu  Lys Met Phe Glu Asp Arg
              -105                -100                      -95

tta tgt cat aaa aca  tat tta aat ggt gat  cat gta acc cat cct gac     456
Leu Cys His Lys Thr  Tyr Leu Asn Gly Asp  His Val Thr His Pro Asp
               -90                 -85                  -80

ttc atg ttg tat gac  gct ctt gat gtt gtt  tta tac atg gac cca atg     504
Phe Met Leu Tyr Asp  Ala Leu Asp Val Val  Leu Tyr Met Asp Pro Met
               -75                 -70                  -65

tgc ctg gat gcg ttc  cca aaa tta gtt tgt  ttt aaa aaa cgt att gaa     552
Cys Leu Asp Ala Phe  Pro Lys Leu Val Cys  Phe Lys Lys Arg Ile Glu
           -60                 -55                  -50

gct atc cca caa att  gat aag tac ttg aaa  tcc agc aag tat ata gca     600
Ala Ile Pro Gln Ile  Asp Lys Tyr Leu Lys  Ser Ser Lys Tyr Ile Ala
-45                     -40                 -35                  -30

tgg cct ttg cag ggc  tgg caa gcc acg ttt  ggt ggt ggc gac cat cct     648
Trp Pro Leu Gln Gly  Trp Gln Ala Thr Phe  Gly Gly Gly Asp His Pro
               -25                 -20                  -15

cca aaa tcg gat ctg  gtt ccg cgt gga tcc  ccg gaa ttc gct cct act     696
Pro Lys Ser Asp Leu  Val Pro Arg Gly Ser  Pro Glu Phe Ala Pro Thr
           -10                  -5                 -1  1

gtc aag att gat gct  ggg atg gtg gtc ggc  acg act act act gtc ccc     744
Val Lys Ile Asp Ala  Gly Met Val Val Gly  Thr Thr Thr Thr Val Pro
  5                     10                 15

ggc acc act gcg acc  gtc agc gag ttc ttg  ggc gtt cct ttt gcc gcc     792
Gly Thr Thr Ala Thr  Val Ser Glu Phe Leu  Gly Val Pro Phe Ala Ala
20                      25                 30                   35

tct ccg aca cga ttt  gcg cct cct act cgt  ccc gtg cct tgg tca acg     840
Ser Pro Thr Arg Phe  Ala Pro Pro Thr Arg  Pro Val Pro Trp Ser Thr
                40                 45                  50

cct ttg caa gcc act  gca tat ggt cca gca  tgc cct caa caa ttc aat     888
Pro Leu Gln Ala Thr  Ala Tyr Gly Pro Ala  Cys Pro Gln Gln Phe Asn
              55                 60                  65

tac ccc gaa gaa ctc  cgt gag att acg atg  gcc tgg ttc aat aca ccg     936
Tyr Pro Glu Glu Leu  Arg Glu Ile Thr Met  Ala Trp Phe Asn Thr Pro
          70                 75                  80

ccc ccg tca gct ggt  gaa agt gag gac tgc  ctg aac ctc aac atc tac     984
Pro Pro Ser Ala Gly  Glu Ser Glu Asp Cys  Leu Asn Leu Asn Ile Tyr
      85                 90                  95
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62

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gtc cca gga act gag aac aca aac aaa gcc gtc atg gtt tgg ata tac        1032
Val Pro Gly Thr Glu Asn Thr Asn Lys Ala Val Met Val Trp Ile Tyr
100             105             110             115

ggt gga gcg ctg gaa tat ggt tgg aat tca ttc cac ctt tac gac ggg        1080
Gly Gly Ala Leu Glu Tyr Gly Trp Asn Ser Phe His Leu Tyr Asp Gly
            120             125             130

gct agt ttc gca gcc aat cag gat gtc atc gcc gtg acc atc aac tac        1128
Ala Ser Phe Ala Ala Asn Gln Asp Val Ile Ala Val Thr Ile Asn Tyr
            135             140             145

aga acg aac att ctg ggg ttc cct gct gcc cct cag ctt cca ata aca        1176
Arg Thr Asn Ile Leu Gly Phe Pro Ala Ala Pro Gln Leu Pro Ile Thr
            150             155             160

cag cga aat ctg ggg ttc cta gac caa agg ttt gct ttg gat tgg gta        1224
Gln Arg Asn Leu Gly Phe Leu Asp Gln Arg Phe Ala Leu Asp Trp Val
            165             170             175

cag cgg aac atc gca gcc ttt ggc ggt gat cct cga aag gtc aca ata        1272
Gln Arg Asn Ile Ala Ala Phe Gly Gly Asp Pro Arg Lys Val Thr Ile
180             185             190             195

ttt ggg cag agt gcg ggg ggc aga agt gtc gac gtc ctc ttg acg tct        1320
Phe Gly Gln Ser Ala Gly Gly Arg Ser Val Asp Val Leu Leu Thr Ser
            200             205             210

atg cca cac aac cca ccc ttc cga gca gca atc atg gag tcc ggt gtg        1368
Met Pro His Asn Pro Pro Phe Arg Ala Ala Ile Met Glu Ser Gly Val
            215             220             225

gct aac tac aac ttc ccc aag gga gat ttg tcc gaa cct tgg aac acc        1416
Ala Asn Tyr Asn Phe Pro Lys Gly Asp Leu Ser Glu Pro Trp Asn Thr
            230             235             240

act gtt caa gct ctc aac tgt acc acc agt atc gac atc ttg agt tgt        1464
Thr Val Gln Ala Leu Asn Cys Thr Thr Ser Ile Asp Ile Leu Ser Cys
245             250             255

atg aga aga gtc gat ctc gcc act ctg atg aac acg atc gag caa ctc        1512
Met Arg Arg Val Asp Leu Ala Thr Leu Met Asn Thr Ile Glu Gln Leu
260             265             270             275

gga ctt ggg ttt gag tac acg ttg gac aac gta acg gct gtg tac cgt        1560
Gly Leu Gly Phe Glu Tyr Thr Leu Asp Asn Val Thr Ala Val Tyr Arg
            280             285             290

tct gaa acg gct cgc acg act ggt gac att gct cgt gta cct gtt ctc        1608
Ser Glu Thr Ala Arg Thr Thr Gly Asp Ile Ala Arg Val Pro Val Leu
            295             300             305

gtc ggg acg gtg gcc aac gac gga ctt ctc ttt gtc ctc ggg gag aat        1656
Val Gly Thr Val Ala Asn Asp Gly Leu Leu Phe Val Leu Gly Glu Asn
            310             315             320

gac acc caa gca tat ctc gag gag gca atc ccg aat cag ccc gac ctt        1704
Asp Thr Gln Ala Tyr Leu Glu Glu Ala Ile Pro Asn Gln Pro Asp Leu
325             330             335
```

63

```
tac cag act ctc ctt gga gca tat ccc att gga tcc cca ggg atc gga      1752
Tyr Gln Thr Leu Leu Gly Ala Tyr Pro Ile Gly Ser Pro Gly Ile Gly
340                 345                 350                 355

tcg cct caa gat cag att gcc gcc att gag acc gag gta aga ttc cag      1800
Ser Pro Gln Asp Gln Ile Ala Ala Ile Glu Thr Glu Val Arg Phe Gln
                    360                 365                 370

tgt cct tct gcc atc gtg gct cag gac tcc cgg aat cgg ggt atc cct      1848
Cys Pro Ser Ala Ile Val Ala Gln Asp Ser Arg Asn Arg Gly Ile Pro
                375                 380                 385

tct tgg cgc tac tac tac aat gcg acc ttt gag aat ctg gag ctt ttc      1896
Ser Trp Arg Tyr Tyr Tyr Asn Ala Thr Phe Glu Asn Leu Glu Leu Phe
            390                 395                 400

cct ggg tcc gaa gtg tac cac agc tct gaa gtc ggg atg gtg ttt ggc      1944
Pro Gly Ser Glu Val Tyr His Ser Ser Glu Val Gly Met Val Phe Gly
        405                 410                 415

acg tat cct gtc gca agt gcg acc gcc ttg gag gcc cag acg agc aaa      1992
Thr Tyr Pro Val Ala Ser Ala Thr Ala Leu Glu Ala Gln Thr Ser Lys
420                 425                 430                 435

tac atg cag ggt gcc tgg gcg gcc ttt gcc aaa aac ccc atg aat ggg      2040
Tyr Met Gln Gly Ala Trp Ala Ala Phe Ala Lys Asn Pro Met Asn Gly
                    440                 445                 450

cct ggg tgg aaa caa gtg ccg aat gtc gcg gcg ctt ggc tca cca ggc      2088
Pro Gly Trp Lys Gln Val Pro Asn Val Ala Ala Leu Gly Ser Pro Gly
                455                 460                 465

aaa gcc atc cag gtt gac gtc tct cca gcg aca ata gac caa cga tgt      2136
Lys Ala Ile Gln Val Asp Val Ser Pro Ala Thr Ile Asp Gln Arg Cys
            470                 475                 480

gcc ttg tac acg cgt tat tat act gag ttg ggc aca atc gcg ccg agg      2184
Ala Leu Tyr Thr Arg Tyr Tyr Thr Glu Leu Gly Thr Ile Ala Pro Arg
        485                 490                 495

aca ttt ggc gga ggc agc ggc gga ggc agc ggc gga ggc agc aaa gac      2232
Thr Phe Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Lys Asp
500                 505                 510                 515

aac gtt gcg gac gtg gta gtg gtg ggc gct ggc ttg agc ggt ttg gag      2280
Asn Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu
                520                 525                 530

acg gca cgc aaa gtc cag gcc gcc ggt ctg tcc tgc ctc gtt ctt gag      2328
Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu
                535                 540                 545

gcg atg gat cgt gta ggg gga aag act ctg agc gta caa tcg ggt ccc      2376
Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro
            550                 555                 560

ggc agg acg act atc aac gac ctc ggc gct gcg tgg atc aat gac agc      2424
Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser
```

64

```
aac caa agc gaa gta tcc aga ttg ttt gaa aga ttt cat ttg gag ggc    2472
Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly
580             585             590             595

gag ctc cag agg acg act gga aat tca atc cat caa gca caa gac ggt    2520
Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly
                600             605             610

aca acc act aca gct cct tat ggt gac tcc ttg ctg agc gag gag gtt    2568
Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val
                615             620             625

gca agt gca ctt gcg gaa ctc ctc ccc gta tgg tct cag ctg atc gaa    2616
Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu
                630             635             640

gag cat agc ctt caa gac ctc aag gcg agc cct cag gcg aag cgg ctc    2664
Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu
645             650             655

gac agt gtg agc ttc gcg cac tac tgt gag aag gaa cta aac ttg cct    2712
Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn Leu Pro
660             665             670             675

gct gtt ctc ggc gta gca aac cag atc aca cgc gct ctg ctc ggt gtg    2760
Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val
                680             685             690

gaa gcc cac gag atc agc atg ctt ttt ctc acc gac tac atc aag agt    2808
Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser
                695             700             705

gcc acc ggt ctc agt aat att ttc tcg gac aag aaa gac ggc ggg cag    2856
Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln
                710             715             720

tat atg cga tgc aaa aca ggt atg cag tcg att tgc cat gcc atg tca    2904
Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala Met Ser
        725             730             735

aag gaa ctt gtt cca ggc tca gtg cac ctc aac acc ccc gtc gct gaa    2952
Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val Ala Glu
740             745             750             755

att gag cag tcg gca tcc ggc tgt aca gta cga tcg gcc tcg ggc gcc    3000
Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala
                760             765             770

gtg ttc cga agc aaa aag gtg gtg gtt tcg tta ccg aca acc ttg tat    3048
Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr
                775             780             785

ccc acc ttg aca ttt tca cca cct ctt ccc gcc gag aag caa gca ttg    3096
Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu
                790             795             800

gcg gaa aat tct atc ctg ggc tac tat agc aag ata gtc ttc gta tgg    3144
Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp
```

65

```
Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp
    805             810             815

gac aag ccg tgg tgg cgc gaa caa ggc ttc tcg ggc gtc ctc caa tcg    3192
Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser
    820             825             830             835

agc tgt gac ccc atc tca ttt gcc aga gat acc agc atc gac gtc gat    3240
Ser Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp
                840             845             850

cga caa tgg tcc att acc tgt ttc atg gtc gga gac ccg gga cgg aag    3288
Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys
            855             860             865

tgg tcc caa cag tcc aag cag gta cga caa aag tct gtc tgg gac caa    3336
Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln
        870             875             880

ctc cgc gca gcc tac gag aac gcc ggg gcc caa gtc cca gag ccg gcc    3384
Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala
        885             890             895

aac gtg ctc gaa atc gag tgg tcg aag cag cag tat ttc caa gga gct    3432
Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala
900             905             910             915

ccg agc gcc gtc tat ggg ctg aac gat ctc atc aca ctg ggt tcg gcg    3480
Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala
                920             925             930

ctc aga acg ccg ttc aag agt gtt cat ttc gtt gga acg gag acg tct    3528
Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu Thr Ser
            935             940             945

tta gtt tgg aaa ggg tat atg gaa ggg gcc ata cga tcg ggt caa cga    3576
Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg
            950             955             960

ggt gct gca gaa gtt gtg gct agc ctg gtg cca gca gca tag           3618
Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
    965             970             975


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66

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Met Ser Pro Ile Leu  Gly Tyr Trp Lys Ile  Lys Gly Leu Val Gln
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Pro Thr Arg Leu Leu  Leu Glu Tyr Leu Glu  Glu Lys Tyr Glu Glu
              -210               -205               -200


His Leu Tyr Glu Arg  Asp Glu Gly Asp Lys  Trp Arg Asn Lys Lys
              -195               -190               -185


Phe Glu Leu Gly Leu  Glu Phe Pro Asn Leu  Pro Tyr Tyr Ile Asp
              -180               -175               -170


Gly Asp Val Lys Leu  Thr Gln Ser Met Ala  Ile Ile Arg Tyr Ile
              -165               -160               -155


Ala Asp Lys His Asn  Met Leu Gly Gly Cys  Pro Lys Glu Arg Ala
              -150               -145               -140


Glu Ile Ser Met Leu  Glu Gly Ala Val Leu  Asp Ile Arg Tyr Gly
              -135               -130               -125


Val Ser Arg Ile Ala  Tyr Ser Lys Asp Phe  Glu Thr Leu Lys Val
              -120               -115               -110


Asp Phe Leu Ser Lys  Leu Pro Glu Met Leu  Lys Met Phe Glu Asp Arg
              -105               -100                -95


Leu Cys His Lys Thr Tyr Leu Asn Gly Asp His Val Thr His Pro Asp
             -90               -85                -80


Phe Met Leu Tyr Asp Ala Leu Asp Val Val Leu Tyr Met Asp Pro Met
             -75               -70                -65
```

67

```
Cys Leu Asp Ala Phe Pro Lys Leu Val Cys Phe Lys Lys Arg Ile Glu
    -60             -55             -50

Ala Ile Pro Gln Ile Asp Lys Tyr Leu Lys Ser Ser Lys Tyr Ile Ala
-45             -40             -35             -30

Trp Pro Leu Gln Gly Trp Gln Ala Thr Phe Gly Gly Gly Asp His Pro
            -25             -20             -15

Pro Lys Ser Asp Leu Val Pro Arg Gly Ser Pro Glu Phe Ala Pro Thr
            -10             -5              -1  1

Val Lys Ile Asp Ala Gly Met Val Val Gly Thr Thr Thr Thr Val Pro
    5               10              15

Gly Thr Thr Ala Thr Val Ser Glu Phe Leu Gly Val Pro Phe Ala Ala
20              25              30              35

Ser Pro Thr Arg Phe Ala Pro Pro Thr Arg Pro Val Pro Trp Ser Thr
            40              45              50

Pro Leu Gln Ala Thr Ala Tyr Gly Pro Ala Cys Pro Gln Gln Phe Asn
            55              60              65

Tyr Pro Glu Glu Leu Arg Glu Ile Thr Met Ala Trp Phe Asn Thr Pro
    70              75              80

Pro Pro Ser Ala Gly Glu Ser Glu Asp Cys Leu Asn Leu Asn Ile Tyr
    85              90              95

Val Pro Gly Thr Glu Asn Thr Asn Lys Ala Val Met Val Trp Ile Tyr
100             105             110                 115

Gly Gly Ala Leu Glu Tyr Gly Trp Asn Ser Phe His Leu Tyr Asp Gly
            120             125             130

Ala Ser Phe Ala Ala Asn Gln Asp Val Ile Ala Val Thr Ile Asn Tyr
            135             140             145

Arg Thr Asn Ile Leu Gly Phe Pro Ala Ala Pro Gln Leu Pro Ile Thr
            150             155             160

Gln Arg Asn Leu Gly Phe Leu Asp Gln Arg Phe Ala Leu Asp Trp Val
    165             170             175
```

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```
Gln Arg Asn Ile Ala Ala Phe Gly Gly Asp Pro Arg Lys Val Thr Ile
180             185             190             195


Phe Gly Gln Ser Ala Gly Gly Arg Ser Val Asp Val Leu Leu Thr Ser
            200             205             210


Met Pro His Asn Pro Pro Phe Arg Ala Ala Ile Met Glu Ser Gly Val
            215             220             225


Ala Asn Tyr Asn Phe Pro Lys Gly Asp Leu Ser Glu Pro Trp Asn Thr
            230             235             240


Thr Val Gln Ala Leu Asn Cys Thr Thr Ser Ile Asp Ile Leu Ser Cys
    245             250             255


Met Arg Arg Val Asp Leu Ala Thr Leu Met Asn Thr Ile Glu Gln Leu
260             265             270             275


Gly Leu Gly Phe Glu Tyr Thr Leu Asp Asn Val Thr Ala Val Tyr Arg
            280             285             290


Ser Glu Thr Ala Arg Thr Thr Gly Asp Ile Ala Arg Val Pro Val Leu
            295             300             305


Val Gly Thr Val Ala Asn Asp Gly Leu Leu Phe Val Leu Gly Glu Asn
            310             315             320


Asp Thr Gln Ala Tyr Leu Glu Glu Ala Ile Pro Asn Gln Pro Asp Leu
    325             330             335


Tyr Gln Thr Leu Leu Gly Ala Tyr Pro Ile Gly Ser Pro Gly Ile Gly
340             345             350             355


Ser Pro Gln Asp Gln Ile Ala Ala Ile Glu Thr Glu Val Arg Phe Gln
            360             365             370


Cys Pro Ser Ala Ile Val Ala Gln Asp Ser Arg Asn Arg Gly Ile Pro
            375             380             385


Ser Trp Arg Tyr Tyr Tyr Asn Ala Thr Phe Glu Asn Leu Glu Leu Phe
            390             395             400


Pro Gly Ser Glu Val Tyr His Ser Ser Glu Val Gly Met Val Phe Gly
    405             410             415
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69

Thr Tyr Pro Val Ala Ser Ala Thr Ala Leu Glu Ala Gln Thr Ser Lys
420   425   430   435

Tyr Met Gln Gly Ala Trp Ala Ala Phe Ala Lys Asn Pro Met Asn Gly
                440   445   450

Pro Gly Trp Lys Gln Val Pro Asn Val Ala Ala Leu Gly Ser Pro Gly
            455   460   465

Lys Ala Ile Gln Val Asp Val Ser Pro Ala Thr Ile Asp Gln Arg Cys
        470   475   480

Ala Leu Tyr Thr Arg Tyr Tyr Thr Glu Leu Gly Thr Ile Ala Pro Arg
        485   490   495

Thr Phe Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Lys Asp
500   505   510   515

Asn Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu
            520   525   530

Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu
            535   540   545

Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro
        550   555   560

Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser
    565   570   575

Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly
580   585   590   595

Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly
            600   605   610

Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val
            615   620   625

Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu
        630   635   640

Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu

70

645   650   655

Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn Leu Pro
660   665   670   675

Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val
                680   685   690

Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser
                695   700   705

Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln
            710   715   720

Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala Met Ser
            725   730   735

Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val Ala Glu
740   745   750   755

Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala
                760   765   770

Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr
            775   780   785

Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu
            790   795   800

Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp
            805   810   815

Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser
820   825   830   835

Ser Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp
                840   845   850

Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys
                855   860   865

Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln
                870   875   880

71

```
Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala
    885                 890                 895

Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala
900                 905                 910                 915

Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala
                920                 925                 930

Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu Thr Ser
                935                 940                 945

Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg
        950                 955                 960

Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
    965                 970                 975
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       on vector pGEX-4T-1

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<223>  gst + polylinker


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Met Ser Pro Ile Leu  Gly Tyr Trp Lys Ile  Lys Gly Leu Val Gln
            -225              -220              -215

ccc act cga ctt ctt  ttg gaa tat ctt gaa  gaa aaa tat gaa gag       90
Pro Thr Arg Leu Leu  Leu Glu Tyr Leu Glu  Glu Lys Tyr Glu Glu
            -210              -205              -200

cat ttg tat gag cgc  gat gaa ggt gat aaa  tgg cga aac aaa aag      135
His Leu Tyr Glu Arg  Asp Glu Gly Asp Lys  Trp Arg Asn Lys Lys
            -195              -190              -185

ttt gaa ttg ggt ttg  gag ttt ccc aat ctt  cct tat tat att gat      180
Phe Glu Leu Gly Leu  Glu Phe Pro Asn Leu  Pro Tyr Tyr Ile Asp
            -180              -175              -170

ggt gat gtt aaa tta  aca cag tct atg gcc  atc ata cgt tat ata      225
Gly Asp Val Lys Leu  Thr Gln Ser Met Ala  Ile Ile Arg Tyr Ile
            -165              -160              -155

gct gac aag cac aac  atg ttg ggt ggt tgt  cca aaa gag cgt gca      270
Ala Asp Lys His Asn  Met Leu Gly Gly Cys  Pro Lys Glu Arg Ala
            -150              -145              -140

gag att tca atg ctt  gaa gga gcg gtt ttg  gat att aga tac ggt      315
Glu Ile Ser Met Leu  Glu Gly Ala Val Leu  Asp Ile Arg Tyr Gly
            -135              -130              -125

gtt tcg aga att gca  tat agt aaa gac ttt  gaa act ctc aaa gtt      360
Val Ser Arg Ile Ala  Tyr Ser Lys Asp Phe  Glu Thr Leu Lys Val
            -120              -115              -110

gat ttt ctt agc aag  cta cct gaa atg ctg  aaa atg ttc gaa gat cgt  408
Asp Phe Leu Ser Lys  Leu Pro Glu Met Leu  Lys Met Phe Glu Asp Arg
            -105              -100               -95

tta tgt cat aaa aca  tat tta aat ggt gat  cat gta acc cat cct gac  456
Leu Cys His Lys Thr  Tyr Leu Asn Gly Asp  His Val Thr His Pro Asp
             -90               -85               -80

ttc atg ttg tat gac  gct ctt gat gtt gtt  tta tac atg gac cca atg  504
Phe Met Leu Tyr Asp  Ala Leu Asp Val Val  Leu Tyr Met Asp Pro Met
             -75               -70               -65

tgc ctg gat gcg ttc  cca aaa tta gtt tgt  ttt aaa aaa cgt att gaa  552
Cys Leu Asp Ala Phe  Pro Lys Leu Val Cys  Phe Lys Lys Arg Ile Glu
         -60               -55               -50

gct atc cca caa att  gat aag tac ttg aaa  tcc agc aag tat ata gca  600
```

```
Ala Ile Pro Gln Ile Asp Lys Tyr Leu Lys Ser Ser Lys Tyr Ile Ala
-45             -40             -35             -30


tgg cct ttg cag ggc tgg caa gcc acg ttt ggt ggt ggc gac cat cct       648
Trp Pro Leu Gln Gly Trp Gln Ala Thr Phe Gly Gly Gly Asp His Pro
            -25             -20                     -15


cca aaa tcg gat ctg gtt ccg cgt gga tcc ccg gaa ttc acg gat ttt       696
Pro Lys Ser Asp Leu Val Pro Arg Gly Ser Pro Glu Phe Thr Asp Phe
            -10             -5              -1  1


ccg gtc cgc agg acc gat ctg ggc cag gtt cag gga ctg gcc ggg gac       744
Pro Val Arg Arg Thr Asp Leu Gly Gln Val Gln Gly Leu Ala Gly Asp
    5               10              15


gtg atg agc ttt cgc gga ata ccc tat gca gcg ccg ccg gtg ggc ggg       792
Val Met Ser Phe Arg Gly Ile Pro Tyr Ala Ala Pro Pro Val Gly Gly
20              25              30                      35


ctg cgt tgg aag ccg ccc caa cac gcc cgg ccc tgg gcg ggc gtt cgc       840
Leu Arg Trp Lys Pro Pro Gln His Ala Arg Pro Trp Ala Gly Val Arg
                40              45                      50


ccc gcc acc caa ttt ggc tcc gac tgc ttc ggc gcg gcc tat ctt cgc       888
Pro Ala Thr Gln Phe Gly Ser Asp Cys Phe Gly Ala Ala Tyr Leu Arg
                55              60                      65


aaa ggc agc ctc gcc ccc ggc gtg agc gag gac tgt ctt tac ctc aac       936
Lys Gly Ser Leu Ala Pro Gly Val Ser Glu Asp Cys Leu Tyr Leu Asn
            70              75                      80


gta tgg gcg ccg tca ggc gct aaa ccc ggc cag tac ccc gtc atg gtc       984
Val Trp Ala Pro Ser Gly Ala Lys Pro Gly Gln Tyr Pro Val Met Val
    85              90                      95


tgg gtc tac ggc ggc ggc ttc gcc ggc ggc acg gcc gcc atg ccc tac      1032
Trp Val Tyr Gly Gly Gly Phe Ala Gly Gly Thr Ala Ala Met Pro Tyr
100             105                     110                     115


tac gac ggc gag gcg ctt gcg cga cag ggc gtc gtc gtg gtg acg ttt      1080
Tyr Asp Gly Glu Ala Leu Ala Arg Gln Gly Val Val Val Val Thr Phe
                120                     125                     130


aac tat cgg acg aac atc ctg ggc ttt ttc gcc cat cct ggt ctc tcg      1128
Asn Tyr Arg Thr Asn Ile Leu Gly Phe Phe Ala His Pro Gly Leu Ser
                135                     140                     145


cgc gag agc ccc acc gga act tcg ggc aac tac ggc cta ctc gac att      1176
Arg Glu Ser Pro Thr Gly Thr Ser Gly Asn Tyr Gly Leu Leu Asp Ile
            150                     155                     160


ctc gcc gct ctt cgg tgg gtg cag agc aac gcc cgc gcc ttc gga ggg      1224
Leu Ala Ala Leu Arg Trp Val Gln Ser Asn Ala Arg Ala Phe Gly Gly
    165                     170                     175


gac ccc ggc cga gtg acg gtc ttt ggt gaa tcg gcc gga gcg agc gcg      1272
Asp Pro Gly Arg Val Thr Val Phe Gly Glu Ser Ala Gly Ala Ser Ala
180                     185                     190                 195
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74

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atc gga ctt ctg ctc acc tcg ccg ctg agc aag ggt ctc ttc cgt ggc        1320
Ile Gly Leu Leu Leu Thr Ser Pro Leu Ser Lys Gly Leu Phe Arg Gly
            200             205             210

gct atc ctc gaa agt cca ggg ctg acg cga ccg ctc gcg acg ctc gcc        1368
Ala Ile Leu Glu Ser Pro Gly Leu Thr Arg Pro Leu Ala Thr Leu Ala
            215             220             225

gac agc gcc gcc tcg ggc gag cgc ctc gac gcc gat ctt tcg cga ctg        1416
Asp Ser Ala Ala Ser Gly Glu Arg Leu Asp Ala Asp Leu Ser Arg Leu
            230             235             240

cgc tcg acc gac cca gcc acc ctg atg gcg cgc gcc gac gcg gcc cgc        1464
Arg Ser Thr Asp Pro Ala Thr Leu Met Ala Arg Ala Asp Ala Ala Arg
            245             250             255

ccg gca tcg cgg gac ctg cgc agg ccg cgt ccg acc gga ccg atc gtc        1512
Pro Ala Ser Arg Asp Leu Arg Arg Pro Arg Pro Thr Gly Pro Ile Val
260             265             270             275

gat ggc cat gtg ctg ccg cag acc gac agc gcg gcg atc gcg gcg ggg        1560
Asp Gly His Val Leu Pro Gln Thr Asp Ser Ala Ala Ile Ala Ala Gly
            280             285             290

cag ctg gcg ccg gtt cgg gtc ctg atc gga acc aat gcc gac gaa ggc        1608
Gln Leu Ala Pro Val Arg Val Leu Ile Gly Thr Asn Ala Asp Glu Gly
            295             300             305

cgc gcc ttc ctc ggg cgc gcg ccg atg gag acg cca gcg gac tac caa        1656
Arg Ala Phe Leu Gly Arg Ala Pro Met Glu Thr Pro Ala Asp Tyr Gln
            310             315             320

gcc tat ctg gag gcg cag ttt ggc gac caa gcc gcc gcc gtg gcg gcg        1704
Ala Tyr Leu Glu Ala Gln Phe Gly Asp Gln Ala Ala Ala Val Ala Ala
            325             330             335

tgc tat ccc ctc gac ggc cgg gcc acg ccc aag gaa atg gtc gcg cgc        1752
Cys Tyr Pro Leu Asp Gly Arg Ala Thr Pro Lys Glu Met Val Ala Arg
340             345             350             355

atc ttc ggc gac aat cag ttc aat cgg ggg gtc tcg gcc ttc tcg gaa        1800
Ile Phe Gly Asp Asn Gln Phe Asn Arg Gly Val Ser Ala Phe Ser Glu
            360             365             370

gcg ctt gtg cgc cag ggc gcg ccc gtg tgg cgt tat cag ttc aac ggt        1848
Ala Leu Val Arg Gln Gly Ala Pro Val Trp Arg Tyr Gln Phe Asn Gly
            375             380             385

aat acc gag ggt gga aga gcg ccg gct acc cac gga gcc gaa att ccc        1896
Asn Thr Glu Gly Gly Arg Ala Pro Ala Thr His Gly Ala Glu Ile Pro
            390             395             400

tac gtt ttc ggg gtg ttc aag ctc gac gag ttg ggt ctg ttc gat tgg        1944
Tyr Val Phe Gly Val Phe Lys Leu Asp Glu Leu Gly Leu Phe Asp Trp
            405             410             415

ccg ccc gag ggg ccc acg ccc gcc gac cgt gcg ctg ggc caa ctg atg        1992
Pro Pro Glu Gly Pro Thr Pro Ala Asp Arg Ala Leu Gly Gln Leu Met
420             425             430             435
```

75

```
tcc tcc gcc tgg gtc cgg ttc gcc aag aat ggc gac ccc gcc ggg gac      2040
Ser Ser Ala Trp Val Arg Phe Ala Lys Asn Gly Asp Pro Ala Gly Asp
            440                 445                 450

gcc ctt acc tgg cct gcc tat tct acg ggc aag tcg acc atg aca ttc      2088
Ala Leu Thr Trp Pro Ala Tyr Ser Thr Gly Lys Ser Thr Met Thr Phe
            455                 460                 465

ggt ccc gag ggc cgc gcg gcg gtg gtg tcg ccc gga cct tcc atc ccc      2136
Gly Pro Glu Gly Arg Ala Ala Val Val Ser Pro Gly Pro Ser Ile Pro
            470                 475                 480

cct tgc gcg gat ggc gcc aag gcg ggg ggc gga ggc agc ggc gga ggc      2184
Pro Cys Ala Asp Gly Ala Lys Ala Gly Gly Gly Gly Ser Gly Gly Gly
            485                 490                 495

agc ggc gga ggc agc aaa gac aac gtt gcg gac gtg gta gtg gtg ggc      2232
Ser Gly Gly Gly Ser Lys Asp Asn Val Ala Asp Val Val Val Val Gly
500                 505                 510                 515

gct ggc ttg agc ggt ttg gag acg gca cgc aaa gtc cag gcc gcc ggt      2280
Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val Gln Ala Ala Gly
            520                 525                 530

ctg tcc tgc ctc gtt ctt gag gcg atg gat cgt gta ggg gga aag act      2328
Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val Gly Gly Lys Thr
            535                 540                 545

ctg agc gta caa tcg ggt ccc ggc agg acg act atc aac gac ctc ggc      2376
Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly
            550                 555                 560

gct gcg tgg atc aat gac agc aac caa agc gaa gta tcc aga ttg ttt      2424
Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val Ser Arg Leu Phe
565                 570                 575

gaa aga ttt cat ttg gag ggc gag ctc cag agg acg act gga aat tca      2472
Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser
580                 585                 590                 595

atc cat caa gca caa gac ggt aca acc act aca gct cct tat ggt gac      2520
Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp
                600                 605                 610

tcc ttg ctg agc gag gag gtt gca agt gca ctt gcg gaa ctc ctc ccc      2568
Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala Glu Leu Leu Pro
            615                 620                 625

gta tgg tct cag ctg atc gaa gag cat agc ctt caa gac ctc aag gcg      2616
Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln Asp Leu Lys Ala
            630                 635                 640

agc cct cag gcg aag cgg ctc gac agt gtg agc ttc gcg cac tac tgt      2664
Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe Ala His Tyr Cys
            645                 650                 655

gag aag gaa cta aac ttg cct gct gtt ctc ggc gta gca aac cag atc      2712
Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val Ala Asn Gln Ile
```

76

```
aca cgc gct ctg ctc ggt gtg gaa gcc cac gag atc agc atg ctt ttt    2760
Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile Ser Met Leu Phe
            680                 685                 690

ctc acc gac tac atc aag agt gcc acc ggt ctc agt aat att ttc tcg    2808
Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser
            695                 700                 705

gac aag aaa gac ggc ggg cag tat atg cga tgc aaa aca ggt atg cag    2856
Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln
            710                 715                 720

tcg att tgc cat gcc atg tca aag gaa ctt gtt cca ggc tca gtg cac    2904
Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro Gly Ser Val His
            725                 730                 735

ctc aac acc ccc gtc gct gaa att gag cag tcg gca tcc ggc tgt aca    2952
Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr
740                 745                 750                 755

gta cga tcg gcc tcg ggc gcc gtg ttc cga agc aaa aag gtg gtg gtt    3000
Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys Lys Val Val Val
            760                 765                 770

tcg tta ccg aca acc ttg tat ccc acc ttg aca ttt tca cca cct ctt    3048
Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu
            775                 780                 785

ccc gcc gag aag caa gca ttg gcg gaa aat tct atc ctg ggc tac tat    3096
Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr
            790                 795                 800

agc aag ata gtc ttc gta tgg gac aag ccg tgg tgg cgc gaa caa ggc    3144
Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly
            805                 810                 815

ttc tcg ggc gtc ctc caa tcg agc tgt gac ccc atc tca ttt gcc aga    3192
Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile Ser Phe Ala Arg
820                 825                 830                 835

gat acc agc atc gac gtc gat cga caa tgg tcc att acc tgt ttc atg    3240
Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met
            840                 845                 850

gtc gga gac ccg gga cgg aag tgg tcc caa cag tcc aag cag gta cga    3288
Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg
            855                 860                 865

caa aag tct gtc tgg gac caa ctc cgc gca gcc tac gag aac gcc ggg    3336
Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly
            870                 875                 880

gcc caa gtc cca gag ccg gcc aac gtg ctc gaa atc gag tgg tcg aag    3384
Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys
            885                 890                 895

cag cag tat ttc caa gga gct ccg agc gcc gtc tat ggg ctg aac gat    3432
```

```
Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp
900              905              910              915

ctc atc aca ctg ggt tcg gcg ctc aga acg ccg ttc aag agt gtt cat     3480
Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe Lys Ser Val His
                920              925              930

ttc gtt gga acg gag acg tct tta gtt tgg aaa ggg tat atg gaa ggg     3528
Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly
                935              940              945

gcc ata cga tcg ggt caa cga ggt gct gca gaa gtt gtg gct agc ctg     3576
Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu
                950              955              960

gtg cca gca gca tag                                                  3591
Val Pro Ala Ala
    965
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<210> 31
<211> 1196
<212> PRT
<213> Unknown

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<223> Open reading frame of BEST1:K:trAPAO fusion for bacterial exressi
      on vector pGEX-4T-1

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<221> misc_feature
<222> (1)..(687)
<223> gst + polylinker

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<223> spacer sequence

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<222> (2200)..(3588)
<223> K:trAPAO

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<222> (2200)..(2202)
<223> extra lysine

<400> 31

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Met Ser Pro Ile Leu  Gly Tyr Trp Lys Ile  Lys Gly Leu Val Gln
              -225              -220              -215


Pro Thr Arg Leu Leu  Leu Glu Tyr Leu Glu  Glu Lys Tyr Glu Glu
              -210              -205              -200
```

His	Leu	Tyr	Glu	Arg	Asp	Glu	Gly	Asp	Lys	Trp	Arg	Asn	Lys	Lys
				-195					-190					-185

Phe	Glu	Leu	Gly	Leu	Glu	Phe	Pro	Asn	Leu	Pro	Tyr	Tyr	Ile	Asp
				-180					-175					-170

Gly	Asp	Val	Lys	Leu	Thr	Gln	Ser	Met	Ala	Ile	Ile	Arg	Tyr	Ile
				-165					-160					-155

Ala	Asp	Lys	His	Asn	Met	Leu	Gly	Gly	Cys	Pro	Lys	Glu	Arg	Ala
				-150					-145					-140

Glu	Ile	Ser	Met	Leu	Glu	Gly	Ala	Val	Leu	Asp	Ile	Arg	Tyr	Gly
				-135					-130					-125

Val	Ser	Arg	Ile	Ala	Tyr	Ser	Lys	Asp	Phe	Glu	Thr	Leu	Lys	Val
				-120					-115					-110

Asp	Phe	Leu	Ser	Lys	Leu	Pro	Glu	Met	Leu	Lys	Met	Phe	Glu	Asp	Arg
				-105					-100					-95	

Leu	Cys	His	Lys	Thr	Tyr	Leu	Asn	Gly	Asp	His	Val	Thr	His	Pro	Asp
			-90					-85					-80		

Phe	Met	Leu	Tyr	Asp	Ala	Leu	Asp	Val	Val	Leu	Tyr	Met	Asp	Pro	Met
		-75					-70					-65			

Cys	Leu	Asp	Ala	Phe	Pro	Lys	Leu	Val	Cys	Phe	Lys	Lys	Arg	Ile	Glu
	-60					-55					-50				

Ala	Ile	Pro	Gln	Ile	Asp	Lys	Tyr	Leu	Lys	Ser	Ser	Lys	Tyr	Ile	Ala
-45					-40					-35					-30

Trp	Pro	Leu	Gln	Gly	Trp	Gln	Ala	Thr	Phe	Gly	Gly	Gly	Asp	His	Pro
			-25					-20					-15		

Pro	Lys	Ser	Asp	Leu	Val	Pro	Arg	Gly	Ser	Pro	Glu	Phe	Thr	Asp	Phe
			-10					-5					-1	1	

Pro	Val	Arg	Arg	Thr	Asp	Leu	Gly	Gln	Val	Gln	Gly	Leu	Ala	Gly	Asp
	5					10					15				

Val	Met	Ser	Phe	Arg	Gly	Ile	Pro	Tyr	Ala	Ala	Pro	Pro	Val	Gly	Gly
20					25					30					35

Leu Arg Trp Lys Pro Pro Gln His Ala Arg Pro Trp Ala Gly Val Arg
                40   45   50

Pro Ala Thr Gln Phe Gly Ser Asp Cys Phe Gly Ala Ala Tyr Leu Arg
                55   60   65

Lys Gly Ser Leu Ala Pro Gly Val Ser Glu Asp Cys Leu Tyr Leu Asn
            70   75   80

Val Trp Ala Pro Ser Gly Ala Lys Pro Gly Gln Tyr Pro Val Met Val
        85   90   95

Trp Val Tyr Gly Gly Gly Phe Ala Gly Gly Thr Ala Ala Met Pro Tyr
100   105   110   115

Tyr Asp Gly Glu Ala Leu Ala Arg Gln Gly Val Val Val Val Thr Phe
            120   125   130

Asn Tyr Arg Thr Asn Ile Leu Gly Phe Phe Ala His Pro Gly Leu Ser
            135   140   145

Arg Glu Ser Pro Thr Gly Thr Ser Gly Asn Tyr Gly Leu Leu Asp Ile
        150   155   160

Leu Ala Ala Leu Arg Trp Val Gln Ser Asn Ala Arg Ala Phe Gly Gly
    165   170   175

Asp Pro Gly Arg Val Thr Val Phe Gly Glu Ser Ala Gly Ala Ser Ala
180   185   190   195

Ile Gly Leu Leu Leu Thr Ser Pro Leu Ser Lys Gly Leu Phe Arg Gly
            200   205   210

Ala Ile Leu Glu Ser Pro Gly Leu Thr Arg Pro Leu Ala Thr Leu Ala
            215   220   225

Asp Ser Ala Ala Ser Gly Glu Arg Leu Asp Ala Asp Leu Ser Arg Leu
        230   235   240

Arg Ser Thr Asp Pro Ala Thr Leu Met Ala Arg Ala Asp Ala Ala Arg
    245   250   255

Pro Ala Ser Arg Asp Leu Arg Arg Pro Arg Pro Thr Gly Pro Ile Val
260   265   270   275

80

```
Asp Gly His Val Leu Pro Gln Thr Asp Ser Ala Ala Ile Ala Ala Gly
            280               285               290


Gln Leu Ala Pro Val Arg Val Leu Ile Gly Thr Asn Ala Asp Glu Gly
            295               300               305


Arg Ala Phe Leu Gly Arg Ala Pro Met Glu Thr Pro Ala Asp Tyr Gln
            310               315               320


Ala Tyr Leu Glu Ala Gln Phe Gly Asp Gln Ala Ala Ala Val Ala Ala
    325               330               335


Cys Tyr Pro Leu Asp Gly Arg Ala Thr Pro Lys Glu Met Val Ala Arg
340               345               350               355


Ile Phe Gly Asp Asn Gln Phe Asn Arg Gly Val Ser Ala Phe Ser Glu
            360               365               370


Ala Leu Val Arg Gln Gly Ala Pro Val Trp Arg Tyr Gln Phe Asn Gly
            375               380               385


Asn Thr Glu Gly Gly Arg Ala Pro Ala Thr His Gly Ala Glu Ile Pro
            390               395               400


Tyr Val Phe Gly Val Phe Lys Leu Asp Glu Leu Gly Leu Phe Asp Trp
    405               410               415


Pro Pro Glu Gly Pro Thr Pro Ala Asp Arg Ala Leu Gly Gln Leu Met
420               425               430               435


Ser Ser Ala Trp Val Arg Phe Ala Lys Asn Gly Asp Pro Ala Gly Asp
            440               445               450


Ala Leu Thr Trp Pro Ala Tyr Ser Thr Gly Lys Ser Thr Met Thr Phe
            455               460               465


Gly Pro Glu Gly Arg Ala Ala Val Val Ser Pro Gly Pro Ser Ile Pro
            470               475               480


Pro Cys Ala Asp Gly Ala Lys Ala Gly Gly Gly Gly Ser Gly Gly Gly
    485               490               495


Ser Gly Gly Gly Ser Lys Asp Asn Val Ala Asp Val Val Val Val Gly
```

81

Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val Gln Ala Ala Gly
                520   525   530

Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val Gly Gly Lys Thr
                535   540   545

Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly
                550   555   560

Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val Ser Arg Leu Phe
565   570   575

Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser
580   585   590   595

Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp
                600   605   610

Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala Glu Leu Leu Pro
                615   620   625

Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln Asp Leu Lys Ala
                630   635   640

Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe Ala His Tyr Cys
                645   650   655

Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val Ala Asn Gln Ile
660   665   670   675

Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile Ser Met Leu Phe
                680   685   690

Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser
                695   700   705

Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln
                710   715   720

Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro Gly Ser Val His
                725   730   735

82

```
Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr
740         745             750             755

Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys Lys Val Val Val
            760             765             770

Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu
            775             780             785

Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr
        790             795             800

Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly
    805             810             815

Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile Ser Phe Ala Arg
820             825             830             835

Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met
            840             845             850

Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg
        855             860             865

Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly
        870             875             880

Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys
        885             890             895

Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp
900             905             910             915

Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe Lys Ser Val His
            920             925             930

Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly
            935             940             945

Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu
        950             955             960

Val Pro Ala Ala
965
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83

<210> 32
<211> 1803
<212> DNA
<213> Unknown

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<223> Glyc(-) APAO coding sequence; mutation in putative glycosylation
      sites

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<221> CDS
<222> (1)..(1803)
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<400> 32

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atg gca ctt gca ccg agc tac atc aat ccc cca aac gtc gcc tcc cca      48
Met Ala Leu Ala Pro Ser Tyr Ile Asn Pro Pro Asn Val Ala Ser Pro
1               5                   10                  15

gca ggg tat tct cac gtc ggc gta ggc cca gac gga ggg agg tat gtg      96
Ala Gly Tyr Ser His Val Gly Val Gly Pro Asp Gly Gly Arg Tyr Val
                20                  25                  30

aca ata gct gga cag att gga caa gac gct tcg ggc gtg aca gac cct     144
Thr Ile Ala Gly Gln Ile Gly Gln Asp Ala Ser Gly Val Thr Asp Pro
            35                  40                  45

gcc tac gag aaa cag gtt gcc caa gca ttc gcc aat ctg cga gct tgc     192
Ala Tyr Glu Lys Gln Val Ala Gln Ala Phe Ala Asn Leu Arg Ala Cys
        50                  55                  60

ctt gct gca gtt gga gcc act tca aac gac gtc acc aag ctc aat tac     240
Leu Ala Ala Val Gly Ala Thr Ser Asn Asp Val Thr Lys Leu Asn Tyr
65                  70                  75                  80

tac atc gtc gac tac gcc ccg agc aaa ctc acc gca att gga gat ggg     288
Tyr Ile Val Asp Tyr Ala Pro Ser Lys Leu Thr Ala Ile Gly Asp Gly
                85                  90                  95

ctg aag gct acc ttt gcc ctt gac agg ctc cct cct tgc acg ctg gtg     336
Leu Lys Ala Thr Phe Ala Leu Asp Arg Leu Pro Pro Cys Thr Leu Val
                100                 105                 110

cca gtg tcg gcc ttg tct tca cct gaa tac ctc ttt gag gtt gat gcc     384
Pro Val Ser Ala Leu Ser Ser Pro Glu Tyr Leu Phe Glu Val Asp Ala
            115                 120                 125

acg gcg ctg gtg ccg gga cac acg acc cca gac aac gtt gcg gac gtg     432
Thr Ala Leu Val Pro Gly His Thr Thr Pro Asp Asn Val Ala Asp Val
        130                 135                 140

gta gtg gtg ggc gct ggc ttg agc ggt ttg gag acg gca cgc aaa gtc     480
Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val
145                 150                 155                 160

cag gcc gcc ggt ctg tcc tgc ctc gtt ctt gag gcg atg gat cgt gta     528
Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val
                165                 170                 175
```

84

```
ggg gga aag act ctg agc gta caa tcg ggt ccc ggc agg acg act atc        576
Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile
            180             185             190

aac gac ctc ggc gct gcg tgg atc aat gat agc aat cag gcc gaa gta        624
Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ala Glu Val
            195             200             205

tcc aga ttg ttt gaa aga ttt cat ttg gag ggc gag ctc cag agg acg       672
Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr
            210             215             220

act gga aat tca atc cat caa gca caa gac ggt aca acc act aca gct       720
Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala
225             230             235             240

cct tat ggt gac tcc ttg ctg agc gag gag gtt gca agt gca ctt gcg       768
Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala
            245             250             255

gaa ctc ctc ccc gta tgg tct cag ctg atc gaa gag cat agc ctt caa       816
Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln
            260             265             270

gac ctc aag gcg agc cct cag gcg aag cgg ctc gac agt gtg agc ttc       864
Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe
            275             280             285

gcg cac tac tgt gag aag gaa cta aac ttg cct gct gtt ctc ggc gta       912
Ala His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val
            290             295             300

gca aac cag atc aca cgc gct ctg ctc ggt gtg gaa gcc cac gag atc       960
Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile
305             310             315             320

agc atg ctt ttt ctc acc gac tac atc aag agt gcc acc ggt ctc agt      1008
Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser
            325             330             335

aat att ttc tcg gac aag aaa gac ggc ggg cag tat atg cga tgc aaa      1056
Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys
            340             345             350

aca ggt atg cag tcg att tgc cat gcc atg tca aag gaa ctt gtt cca      1104
Thr Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro
            355             360             365

ggc tca gtg cac ctc aac acc ccc gtc gct gaa att gag cag tcg gca      1152
Gly Ser Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala
            370             375             380

tcc ggc tgt aca gta cga tcg gcc tcg ggc gcc gtg ttc cga agc aaa      1200
Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys
385             390             395             400

aag gtg gtg gtt tcg tta ccg aca acc ttg tat ccc acc ttg aca ttt      1248
Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe
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85

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tca cca cct ctt ccc gcc gag aag caa gca ttg gcg gaa aat tct atc    1296
Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile
            420             425             430

ctg ggc tac tat agc aag ata gtc ttc gta tgg gac aag ccg tgg tgg    1344
Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp
            435             440             445

cgc gaa caa ggc ttc tcg ggc gtc ctc caa tcg agc tgt gac ccc atc    1392
Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile
            450             455             460

tca ttt gcc aga gat acc agc atc gac gtc gat cga caa tgg tcc att    1440
Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile
465             470             475             480

acc tgt ttc atg gtc gga gac ccg gga cgg aag tgg tcc caa cag tcc    1488
Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser
            485             490             495

aag cag gta cga caa aag tct gtc tgg gac caa ctc cgc gca gcc tac    1536
Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr
            500             505             510

gag aac gcc ggg gcc caa gtc cca gag ccg gcc aac gtg ctc gaa atc    1584
Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile
            515             520             525

gag tgg tcg aag cag cag tat ttc caa gga gct ccg agc gcc gtc tat    1632
Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr
            530             535             540

ggg ctg aac gat ctc atc aca ctg ggt tcg gcg ctc aga acg ccg ttc    1680
Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe
545             550             555             560

aag agt gtt cat ttc gtt gga acg gag acg tct tta gtt tgg aaa ggg    1728
Lys Ser Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly
            565             570             575

tat atg gaa ggg gcc ata cga tcg ggt caa cga ggt gct gca gaa gtt    1776
Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val
            580             585             590

gtg gct agc ctg gtg cca gca gca tag                                1803
Val Ala Ser Leu Val Pro Ala Ala
            595             600
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<210>  33
<211>  600
<212>  PRT
<213>  Unknown

<220>
<223>  Glyc(-) APAO coding sequence; mutation in putative glycosylation
       sites
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<400> 33

Met Ala Leu Ala Pro Ser Tyr Ile Asn Pro Pro Asn Val Ala Ser Pro
1   5   10   15

Ala Gly Tyr Ser His Val Gly Val Gly Pro Asp Gly Gly Arg Tyr Val
                20   25   30

Thr Ile Ala Gly Gln Ile Gly Gln Asp Ala Ser Gly Val Thr Asp Pro
            35   40   45

Ala Tyr Glu Lys Gln Val Ala Gln Ala Phe Ala Asn Leu Arg Ala Cys
    50   55   60

Leu Ala Ala Val Gly Ala Thr Ser Asn Asp Val Thr Lys Leu Asn Tyr
65   70   75   80

Tyr Ile Val Asp Tyr Ala Pro Ser Lys Leu Thr Ala Ile Gly Asp Gly
            85   90   95

Leu Lys Ala Thr Phe Ala Leu Asp Arg Leu Pro Pro Cys Thr Leu Val
            100   105   110

Pro Val Ser Ala Leu Ser Ser Pro Glu Tyr Leu Phe Glu Val Asp Ala
        115   120   125

Thr Ala Leu Val Pro Gly His Thr Thr Pro Asp Asn Val Ala Asp Val
    130   135   140

Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val
145   150   155   160

Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val
            165   170   175

Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile
            180   185   190

Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ala Glu Val
        195   200   205

Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr
    210   215   220

87

Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala
225   230   235   240

Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala
                245   250   255

Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln
                260   265   270

Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe
            275   280   285

Ala His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val
    290   295   300

Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile
305   310   315   320

Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser
                325   330   335

Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys
                340   345   350

Thr Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro
            355   360   365

Gly Ser Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala
        370   375   380

Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys
385   390   395   400

Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe
                405   410   415

Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile
            420   425   430

Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp
        435   440   445

Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile
    450   455   460

88

```
Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile
465             470         475             480


Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser
            485             490             495


Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr
        500             505             510


Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile
        515             520             525


Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr
        530             535             540


Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe
545             550             555             560


Lys Ser Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly
            565             570             575


Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val
            580             585             590


Val Ala Ser Leu Val Pro Ala Ala
        595             600



<210>   34
<211>   37
<212>   DNA
<213>   Artificial

<220>
<223>   37-mer oligonucleotide

<400>   34
ggggaattca tggcacttgc accgagctac atcaatc                                     37


<210>   35
<211>   1929
<212>   DNA
<213>   Exophiala spinifera

<220>
<221>   Intron
<222>   (739)..(811)
<223>
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89

<220>
<221> Intron
<222> (1134)..(1186)
<223>

<400> 35
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cacatcggcg taggcccaaa cgaagcgagg tatgtgacaa tagctggaca gattggacaa   120

gacgctttgg gcgtgacaga cccagcctac gagaaacagg ttgcccaagc attcgccaat   180

ctgcgagctt gccttgctgc agttggagcc tcttcaaacg acgtcaccaa gctcaattac   240

tacatcgtcg actacgcccc gagcaaactc accgcaattg gagatgggct gaagtctacc   300

tttgcccttg acaggctccc tccttgcacg ctggtgccag taccggcctt ggcttcacct   360

gaatacctct ttgaggttga tgccacggcg ctggtgccag acactcgac cccagacaac   420

gttgcggacg tggtagtggt gggcgctggc ttgagcggtt tggagacggc acgcaaagtc   480

caggccgccg gtctgtcctg cctcgttctt gaggcgatgg atcgtgtagg gggaaagact   540

ctgagcgtac aatcgggtcc cggcaggacg actatcaacg acctcggcgc tgcgtggatc   600

aatgacagca accaaagcga agtatccaga ttgtttgaaa gatttcattt ggagggcgag   660

ctccagagga cgaccggaaa ttcaatccat caagcacaag acggtacaac cactacagct   720

ccttatggtg actccccggt aagcacaatc ccactttgtg atgagacctc tgtcgagtgt   780

agaatacagt cactgactcc acttcgtcca gctgagcgag gaggttgcaa gtgcacttgc   840

ggaactcctc cccgtatggt ctcagctgat cgaagagtat agccttgaag accccaaggc   900

gagccctcag gcgaagcggc tcgacagtgt gagcttcgcg cactactgtg agaaggacct   960

aaacttgcct gctgttctca gcgtggcaaa ccagatcaca cgcgctctgc tcggtgtgga   1020

agcccacgag atcagcatgc tttttctcac cgactacatc aagagtgcca ccggtctcag   1080

taatattgtc tcggacaaga aagacggcgg gcagtatatg cgatgcaaaa caggtgcgtg   1140

cggtgtcctc tcaggtaggg gactcgtttc ttagtggtca ttccaggtat gcagtcgatt   1200

tgccatgcca tgtcaaagga acttgttcca ggctcagtgc acctcaacac ccccgtcgct   1260

ggaattgagc agtcggcgtc cggctgtata gtacgatcgg cctcgggcgc cgtgttccga   1320

agcaaaaagg tggtggtttc gttaccgaca acattgtatc ccaccttgac attttcacca   1380

cctcttcccg ccgagaagca agcattggcg gaaaaatcta tcctcggcta ctatagcaag   1440

atagtcttcg tatgggacaa cccgtggtgg cgcgaacaag cttctcgggg cgtcctccaa   1500

tcgagctgtg accccatctc atttgccaga gataccagca tcgaagtcga tcggcaatgg   1560

tccattacct gtttcatggt cggagacccg ggacggaagt ggtcccaaca gtccaagcag   1620

90

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gtacgacaaa agtctgtctg ggaccaactc cgcgcagcct acgagaacgc cggggcccaa    1680

gtcccagagc cggccaacgt gctcgaaatc gagtggtcga agcagcagta tttccaagga    1740

gctccgagcg ccgtctatgg gctgaacgat ctcatcacac tgggttcggc gctcagaacg    1800

ccgttcaagt gtgttcattt cgttggaacg gagacgtctt tagtttggaa agggtatatg    1860

gaaggggcca tacgatcggg tcaacgaggt gctgcagaag ttgtggctag cctggtgcca    1920

gcagcatag                                                            1929
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<210>   36
<211>   600
<212>   PRT
<213>   Exophilia spinifera

<400>   36

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Met Ala Leu Ala Pro Ser Tyr Ile Asn Pro Pro Asn Val Ala Ser Pro
1               5                   10                  15


Ala Gly Tyr Ser His Ile Gly Val Gly Pro Asn Glu Ala Arg Tyr Val
                20                  25                  30


Thr Ile Ala Gly Gln Ile Gly Gln Asp Ala Leu Gly Val Thr Asp Pro
            35                  40                  45


Ala Tyr Glu Lys Gln Val Ala Gln Ala Phe Ala Asn Leu Arg Ala Cys
        50                  55                  60


Leu Ala Ala Val Gly Ala Ser Ser Asn Asp Val Thr Lys Leu Asn Tyr
65                  70                  75                  80


Tyr Ile Val Asp Tyr Ala Pro Ser Lys Leu Thr Ala Ile Gly Asp Gly
                85                  90                  95


Leu Lys Ser Thr Phe Ala Leu Asp Arg Leu Pro Pro Cys Thr Leu Val
                100                 105                 110


Pro Val Pro Ala Leu Ala Ser Pro Glu Tyr Leu Phe Glu Val Asp Ala
            115                 120                 125


Thr Ala Leu Val Pro Gly His Ser Thr Pro Asp Asn Val Ala Asp Val
            130                 135                 140


Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val
145                 150                 155                 160
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91

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Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val
            165             170             175

Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile
            180             185             190

Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val
            195             200             205

Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr
    210             215             220

Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala
225             230             235             240

Pro Tyr Gly Asp Ser Pro Leu Ser Glu Glu Val Ala Ser Ala Leu Ala
            245             250             255

Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu Tyr Ser Leu Glu
            260             265             270

Asp Pro Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe
            275             280             285

Ala His Tyr Cys Glu Lys Asp Leu Asn Leu Pro Ala Val Leu Ser Val
    290             295             300

Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile
305             310             315             320

Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser
            325             330             335

Asn Ile Val Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys
            340             345             350

Thr Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro
            355             360             365

Gly Ser Val His Leu Asn Thr Pro Val Ala Gly Ile Glu Gln Ser Ala
            370             375             380

Ser Gly Cys Ile Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys
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92

Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe
            405   410   415

Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Lys Ser Ile
            420   425   430

Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Asn Pro Trp Trp
            435   440   445

Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile
    450   455   460

Ser Phe Ala Arg Asp Thr Ser Ile Glu Val Asp Arg Gln Trp Ser Ile
465   470   475   480

Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser
            485   490   495

Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr
            500   505   510

Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile
            515   520   525

Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr
    530   535   540

Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe
545   550   555   560

Lys Cys Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly
            565   570   575

Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val
            580   585   590

Val Ala Ser Leu Val Pro Ala Ala
            595   600

<210>   37
<211>   1929
<212>   DNA
<213>   Exophiala spinifera

93

<220>
<221> Intron
<222> (739)..(811)
<223>

<220>
<221> Intron
<222> (1134)..(1186)
<223>

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cacatcggcg taggcccaaa cgaagcgagg tatgtgacaa tagctggaca gattggacaa   120

gacgctttgg gcgtgacaga cccagcctac gagaaacagg ttgcccaagc attcgccaat   180

ctgcgagctt gccttgctgc agttggagcc tcttcaaacg acgtcaccaa gctcaattac   240

tacatcgtcg actacgcccc gagcaaactc accgcaattg gagatgggct gaagtctacc   300

tttgcccttg acaggctccc tccttgcacg ctggtgccag taccggcctt ggcttcacct   360

gaatacctct ttgaggttga cgccacggcg ctggtgccag acactcgac cccagacaac   420

gttgcggacg tggtagtggt gggcgctggc ttgagcggct tggagacggc acgcaaagtc   480

caggccgccg gtctgtcctg cctcgttctt gaggcgatgg atcgtgtagg gggaaagact   540

ctgagcgtac aatcgggtcc cggcaggacg actatcaacg acctcggcgc tgcgtggatc   600

aatgacagca accaaagcga agtatccaga ttgtttgaaa gatttcattt ggagggcgag   660

ctccagagga cgaccggaaa ttcaatccat caagcacaag acggtacaac cactacagct   720

ccttatggtg actccccggt aagcacaatc ccactttgtg atgagacctc tgtcgagtgt   780

agaatacagt cactgactcc acttcgtcca gctgagcgag gaggttgcaa gtgcacttgc   840

ggaactcctc cccgtatggt ctcagctgat cgaagagtat agccttgaag accccaaggc   900

gagccctcag gcgaagcggc tcgacagtgt gagcttcgcg cactactgtg agaaggacct   960

aaacttgcct gctgttctca gcgtggcaaa ccagatcaca cgcgctctgc tcggtgtgga   1020

agcccacgag atcagcatgc tttttctcac cgactacatc aagagtgcca ccggtctcag   1080

taatattgtc tcggacaaga aagacggcgg gcagtatatg cgatgcaaaa caggtgcgtg   1140

cggtgtcctc tcaggtaggg gactcgtttc ttagtggtca ttccaggtat gcagtcgatt   1200

tgccatgcca tgtcaaagga acttgttcca ggctcagtgc acctcaacac ccccgtcgct   1260

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94

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ccgttcaagt gtgttcattt cgttggaacg gagacgtctt tagtttggaa agggtatatg   1860

gaaggggcca tacgatcggg tcaacgaggt gctgcagaag ttgtggctag cctggtgcca   1920

gcagcatag   1929

<210>   38
<211>   600
<212>   PRT
<213>   Exophiala spinifera

<400>   38

Met Ala Leu Ala Pro Ser Tyr Ile Asn Pro Pro Asn Val Ala Ser Pro
1   5   10   15

Ala Gly Tyr Ser His Ile Gly Val Gly Pro Asn Glu Ala Arg Tyr Val
                20   25   30

Thr Ile Ala Gly Gln Ile Gly Gln Asp Ala Leu Gly Val Thr Asp Pro
            35   40   45

Ala Tyr Glu Lys Gln Val Ala Gln Ala Phe Ala Asn Leu Arg Ala Cys
        50   55   60

Leu Ala Ala Val Gly Ala Ser Ser Asn Asp Val Thr Lys Leu Asn Tyr
65   70   75   80

Tyr Ile Val Asp Tyr Ala Pro Ser Lys Leu Thr Ala Ile Gly Asp Gly
                85   90   95

Leu Lys Ser Thr Phe Ala Leu Asp Arg Leu Pro Pro Cys Thr Leu Val
                100   105   110

Pro Val Pro Ala Leu Ala Ser Pro Glu Tyr Leu Phe Glu Val Asp Ala
            115   120   125

95

```
Thr Ala Leu Val Pro Gly His Ser Thr Pro Asp Asn Val Ala Asp Val
    130             135             140

Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val
145             150             155             160

Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val
                165             170             175

Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile
            180             185             190

Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val
        195             200             205

Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr
    210             215             220

Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala
225             230             235             240

Pro Tyr Gly Asp Ser Pro Leu Ser Glu Glu Val Ala Ser Ala Leu Ala
            245             250             255

Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu Tyr Ser Leu Glu
            260             265             270

Asp Pro Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe
        275             280             285

Ala His Tyr Cys Glu Lys Asp Leu Asn Leu Pro Ala Val Leu Ser Val
    290             295             300

Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile
305             310             315             320

Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser
            325             330             335

Asn Ile Val Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys
            340             345             350

Thr Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro
    355             360             365
```

96

Gly Ser Val His Leu Asn Thr Pro Val Ala Gly Ile Glu Gln Ser Ala
    370   375   380

Ser Gly Cys Ile Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys
    385   390   395   400

Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe
            405   410   415

Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Lys Ser Ile
            420   425   430

Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Asn Pro Trp Trp
        435   440   445

Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile
    450   455   460

Ser Phe Ala Arg Asp Thr Ser Ile Glu Val Asp Arg Gln Trp Ser Ile
465   470   475   480

Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser
            485   490   495

Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr
            500   505   510

Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile
        515   520   525

Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr
    530   535   540

Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe
545   550   555   560

Lys Cys Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly
            565   570   575

Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val
            580   585   590

Val Ala Ser Leu Val Pro Ala Ala
    595   600

97

<210> 39
<211> 1930
<212> DNA
<213> Exophiala spinifera

<220>
<221> Intron
<222> (739)..(811)
<223>

<220>
<221> Intron
<222> (1134)..(1187)
<223>

<220>
<221> misc_feature
<222> (649)..(649)
<223> n = A,T,C or G

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cacgtcggcg taggcccaga cggagggagg tatgtgacaa tagctggaca gattggacaa   120

gacgcttcgg gcgtgacaga ccctgcctac gagaaacagg ttgcccaagc attcgccaat   180

ctgcgagctt gccttgctgc agttggagcc acttcaaacg acgtcaccaa gctcaattac   240

tacatcgtcg actacgcccc gagcaaactc accgcaattg gagatgggct gaaggctacc   300

tttgcccttg acaggctccc tccttgcacg ctggtgccag tgtcggcctt gtcttcacct   360

gaatacctct ttgaggttga tgccacggcg ctggtgccgg gacacacgac cccagacaac   420

gttgcggacg tggtagtggt gggcgctggc ttgagcggtt tggagacggc acgcaaagtc   480

caggccgccg gtctgtcctg cctcgttctt gaggcgatgg atcgtgtagg gggaaagact   540

ctgagcgtac aatcgggtcc cggcaggacg actatcaacg acctcggcgc tgcgtggatc   600

aatgacagca accaaagcga agtatccaga ttgtttgaaa gatttcatnt ggagggcgag   660

ctccagagga cgactggaaa ttcaatccat caagcacaag acggtacaac cactacagct   720

ccttatggtg actccttggt aagcacaatc ccactttgtg atgagacctc tgtcgagtgt   780

agaatacagt cactgattcc acttcgtcca gctgagcgag gaggttgcaa gtgcacttgc   840

ggaactcctc cccgtatggt ctcagctgat cgaagagcat agccttcaag acctcaaggc   900

gagccctcag gcgaagcggc tcgacagtgt gagcttcgcg cactactgtg agaaggaact   960

aaacttgcct gctgttctcg gcgtagcaaa ccagatcaca cgcgctctgc tcggtgtgga   1020

agcccacgag atcagcatgc tttttctcac cgactacatc aagagtgcca ccggtctcag   1080

98

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taatattttc tcggacaaga aagacggcgg gcagtatatg cgatgcaaaa caggtgcgtg   1140

tggtgtcgtc tcaggtgggg gactcgtttc tcaagtggtc atttcaggta tgcagtcgat   1200

ttgccatgcc atgtcaaagg aacttgttcc aggctcagtg cacctcaaca cccccgtcgc   1260

tgaaattgag cagtcggcat ccggctgtac agtacgatcg gcctcgggcg ccgtgttccg   1320

aagcaaaaag gtggtggttt cgttaccgac aaccttgtat cccaccttga cattttcacc   1380

acctctcccc gccgagaagc aagcattggc ggaaaattct atcctgggct actatagcaa   1440

gatagtcttc gtatgggaca agccgtggtg gcgcgaacaa ggcttctcgg gcgtcctcca   1500

atcgagctgt gaccccatct catttgccag agataccagc atcgacgtcg atcgacaatg   1560

gtccattacc tgtttcatgg tcggagaccc gggacggaag tggtcccaac agtccaagca   1620

ggtacgacaa aagtctgtct gggaccaact ccgcgcagcc tacgagaacg ccggggccca   1680

agtcccagag ccggccaacg tgctcgaaat cgagtggtcg aagcagcagt atttccaagg   1740

agctccgagc gccgtctatg ggctgaacga tctcatcaca ctgggttcgg cgctcagaac   1800

gccgttcaag agtgttcatt tcgttggaac ggagacgtct ttagtttgga aagggtatat   1860

ggaaggggcc atacgatcgg gtcaacgagg tgctgcagaa gttgtggcta gcctggtgcc   1920

agcagcatag                                                          1930


<210>   40
<211>   598
<212>   PRT
<213>   Exophiala spinifera

<220>
<221>   MISC_FEATURE
<222>   (216)..(216)
<223>   Xaa = any amino acid


<400>   40

Met Ala Leu Ala Pro Ser Tyr Ile Asn Pro Pro Asn Val Ala Ser Pro
1               5                   10                  15


Ala Gly Tyr Ser His Val Gly Val Gly Pro Asp Gly Gly Arg Tyr Val
            20                  25                  30


Thr Ile Ala Gly Gln Ile Gly Gln Asp Ala Ser Gly Val Thr Asp Pro
        35                  40                  45


Ala Tyr Glu Lys Gln Val Ala Gln Ala Phe Ala Asn Leu Arg Ala Cys
    50                  55                  60
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99

Leu Ala Ala Val Gly Ala Thr Ser Asn Asp Val Thr Lys Leu Asn Tyr
65   70   75   80

Tyr Ile Val Asp Tyr Ala Pro Ser Lys Leu Thr Ala Ile Gly Asp Gly
                85   90   95

Leu Lys Ala Thr Phe Ala Leu Asp Arg Leu Pro Pro Cys Thr Leu Val
                100   105   110

Pro Val Ser Ala Leu Ser Ser Pro Glu Tyr Leu Phe Glu Val Asp Ala
                115   120   125

Thr Ala Leu Val Pro Gly His Thr Thr Pro Asp Asn Val Ala Asp Val
    130   135   140

Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val Gln
145   150   155   160

Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val Gly
                165   170   175

Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile Asn
                180   185   190

Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val Ser
                195   200   205

Arg Leu Phe Glu Arg Phe His Xaa Glu Gly Glu Leu Gln Arg Thr Thr
    210   215   220

Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala Pro
225   230   235   240

Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala Glu
                245   250   255

Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln Asp
                260   265   270

Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe Ala
                275   280   285

His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val Asn

100

290   295   300

Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile Ser Met
305   310   315   320

Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser Asn Ile
                325   330   335

Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys Thr Gly
                340   345   350

Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro Gly Ser
                355   360   365

Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala Ser Gly
                370   375   380

Cys Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys Lys Val
385   390   395   400

Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe Ser Pro
                405   410   415

Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile Leu Gly
                420   425   430

Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp Arg Glu
                435   440   445

Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile Ser Phe
                450   455   460

Ala Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile Thr Cys
465   470   475   480

Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser Lys Gln
                485   490   495

Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr Glu Asn
                500   505   510

Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile Glu Trp
                515   520   525

101

Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr Gly Leu
    530   535   540

Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe Lys Ser
545   550   555   560

Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly Tyr Met
                565   570   575

Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val Val Ala
            580   585   590

Ser Leu Val Pro Ala Ala
        595

<210>   41
<211>   1928
<212>   DNA
<213>   Rhinocladiella atrovirens

<220>
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<222>   (739)..(811)
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gacgcttcgg ccgtgacaga ccctgcctac gagaaacagg ttgcccaagc attcgccaac   180

ctgcgagctt gtcttgctgc agttggagcc acttcaaacg acattaccaa gctcaattac   240

tacatcgtcg actacaaccc gagcaaactc accgcaattg agatgggct gaaggctacc   300

tttgcccttg acaggctccc tccttgcacg ctggtgccag tgccggccct ggcttcacct   360

gaataccct ttgaggttga tgccacggcg ctggttccag dacactcaac cccagacaat   420

gttgcggacg tggtcgtggt gggcgctggc ttgagcggtt tggagacggc acgcaaagtc   480

caggctgccg ggctgtcctg cctcgttctt gaggcgatgg atcgtgtggg gggaaagact   540

ctgagcgtac aatcgggtcc cggcaggacg gctatcaatg acctcggcgc tgcgtggatc   600

aatgacagca accaaagcga agtattcaaa ttatttgaaa gatttcattt ggagggcgag   660

ctccagagga cgaccggaaa ttcaatccat caagcacaag acggtacaac cactacagct   720

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ccttatggtg attccctggt aagcacaatt ccatcttgtg atgagacctc tgtcgtgtgt    780

agaatacagt cgctgactcc acatcgtcca gctgagcgag gaggttgcaa gtgcactcgc    840

ggaactcctt cccgcatggt ctcagctgat cgaagagcat agtcttgaag accccaaggc    900

gagccctcaa gcgaagcagc tcgacagtgt gagcttcgca cactactgtg agaaggatct    960

aagcttgcct gctgttctcg gcgtggcaaa ccagatcaca cgcgctctgc tcggtgtgga   1020

agcccacgag atcagcatgc tttttctcac cgactacatc aagagtgcca ccggtctcag   1080

taatattgtc tcggataaga aagacggtgg gcagtatatg cgatgcaaaa caggtgcgtg   1140

tggtgttctc tcagtgggag actcgtttct tagtggtcat tccaggtatg cagtcgcttt   1200

gccatgccat gtcaaaggaa cttgttccag gctcagtgca cctcaacacc cccgtcgccg   1260

aaattgagca gtcggcatcc ggctgtacag tacgatcggc ctcgggcggc gtgttccgaa   1320

gtaaaaaggt ggtggtttcg ttaccgacaa ccttgtatcc caccttgata ttttcaccac   1380

ctcttcccgc cgagaagcaa gcattggctg aaaaatccat cctgggctac tatagcaaga   1440

tagtcttcgt atgggacaag ccgtggtggc gcgaacaagg cttctcgggc gtcctccaat   1500

cgagctgtga ccccatctca tttgccagag ataccagcat cgaagtcgat cggcaatggt   1560

ccattacctg tttcatggtc ggagacccgg gacggaagtg gtcccaacag tccaagcagg   1620

tacgacagaa gtctgtctgg aaccaactcc gcgcagccta cgagaacgcc ggggcccaag   1680

tcccagagcc ggccaacgtg ctcgagatcg agtggtcgaa gcagcagtat ttccaaggag   1740

cgccgagcgt cgtctatggg ctgaactgtc tcaacacact gggttcggcg ctcagaacgc   1800

cgttcaaggg tgttcatttc gttggaacgg agacgtcttt ggtttggaaa gggtatatgg   1860

aaggggccat acgatcgggt cagcgaggcg ctgcagaagt tgtggctagc ctggtgccag   1920

cagcatag                                                            1928
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<210> 42
<211> 598
<212> PRT
<213> Rhinocladiella atrovirens

<400> 42

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Met Ala Leu Ala Pro Ser Tyr Ile Asn Pro Pro Asn Leu Ala Ser Pro
1               5                   10                  15


Ala Gly Tyr Ser His Val Gly Val Gly Pro Asn Gly Gly Arg Tyr Ala
                20                  25                  30
```

Thr Ile Ala Gly Gln Ile Gly Gln Asp Ala Ser Ala Val Thr Asp Pro
    35   40   45

Ala Tyr Glu Lys Gln Val Ala Gln Ala Phe Ala Asn Leu Arg Ala Cys
    50   55   60

Leu Ala Ala Val Gly Ala Thr Ser Asn Asp Ile Thr Lys Leu Asn Tyr
65   70   75   80

Tyr Ile Val Asp Tyr Asn Pro Ser Lys Leu Thr Ala Ile Gly Asp Gly
            85   90   95

Leu Lys Ala Thr Phe Ala Leu Asp Arg Leu Pro Pro Cys Thr Leu Val
        100   105   110

Pro Val Pro Ala Leu Ala Ser Pro Glu Tyr Pro Phe Glu Val Asp Ala
        115   120   125

Thr Ala Leu Val Pro Gly His Ser Thr Pro Asp Asn Val Ala Asp Val
    130   135   140

Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val
145   150   155   160

Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val
            165   170   175

Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Ala Ile
        180   185   190

Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val
        195   200   205

Phe Lys Leu Phe Glu Arg Leu Glu Gly Glu Leu Gln Arg Thr Thr Gly
    210   215   220

Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala Pro Tyr
225   230   235   240

Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala Glu Leu
            245   250   255

Leu Pro Ala Trp Ser Gln Leu Ile Glu Glu His Ser Leu Glu Asp Pro
        260   265   270

104

```
Lys Ala Ser Pro Gln Ala Lys Gln Leu Asp Ser Val Ser Phe Ala His
        275             280             285

Tyr Cys Glu Lys Asp Leu Ser Leu Pro Ala Val Leu Gly Val Ala Asn
        290             295             300

Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile Ser Met
305             310             315             320

Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser Asn Ile
            325             330             335

Val Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys Thr Gly
            340             345             350

Met Gln Ser Leu Cys His Ala Met Ser Lys Glu Leu Val Pro Gly Ser
        355             360             365

Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala Ser Gly
        370             375             380

Cys Thr Val Arg Ser Ala Ser Gly Gly Val Phe Arg Ser Lys Lys Val
385             390             395             400

Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Ile Phe Ser Pro
            405             410             415

Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Lys Ser Ile Leu Gly
            420             425             430

Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp Arg Glu
            435             440             445

Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile Ser Phe
        450             455             460

Ala Arg Asp Thr Ser Ile Glu Val Asp Arg Gln Trp Ser Ile Thr Cys
465             470             475             480

Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser Lys Gln
            485             490             495

Val Arg Gln Lys Ser Val Trp Asn Gln Leu Arg Ala Ala Tyr Glu Asn
        500             505             510
```

105

```
Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile Glu Trp
        515                 520                 525


Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Val Val Tyr Gly Leu
        530                 535                 540


Asn Cys Leu Asn Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe Lys Gly
545                 550                 555                 560


Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly Tyr Met
                565                 570                 575


Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val Val Ala
        580                 585                 590


Ser Leu Val Pro Ala Ala
        595



<210>   43
<211>   1928
<212>   DNA
<213>   Rhinocladiella atrovirens

<220>
<221>   Intron
<222>   (739)..(811)
<223>

<220>
<221>   Intron
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gacgcttcgg ccgtgacaga ccctgcctac gagaaacagg ttgcccaagc attcgccaac     180

ctgcgagctt gtcttgctgc agttggagcc acttcaaacg acattaccaa gctcaattac     240

tacatcgtcg actacaaccc gagcaaactc accgcaattg gagatgggct gaaggctacc     300

tttgcccttg acaggctccc tccttgcacg ctggtgccag tgccggccct ggcttcacct     360

gaatacctct ttgaggttga tgccacggcg ctggttccag gacactcaac cccagacaat     420

gttgcggacg tggtcgtggt gggcgctggc ttgagcggtt tggagacggc acgcaaagtc     480

caggctgccg ggctgtcctg cctcgttctt gaggcgatgg atcgtgtggg gggaaagact     540
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106

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ctgagcgtac aatcgggtcc cggcaggacg actatcaatg acctcggcgc tgcgtggatc      600

aatgacagca accaaagcga agtattcaaa ttatttgaaa gatttcattt ggagggcgag      660

ctccagagga cgaccggaaa ttcaatccat caagcacaag acggtacaac cactacagct      720

ccttatggtg attccctggt aagcacaatt ccatcttgtg atgagacctc tgtcgtgtgt      780

agaatacagt cgctgactcc acatcgtcca gctgagcgag gaggttgcaa gtgcactcgc      840

ggaactcctt cccgcatggt ctcagctgat cgaagagcat agtcttgaag accccaaggc      900

gagccctcaa gcgaagcagc tcgacagtgt gagcttcgca cactactgtg agaaggatct      960

aaacttgcct gctgttctcg gcgtggcaaa ccagatcaca cgcgctctgc tcggtgtgga     1020

agcccacgag atcagcatgt tttttctcac cgactacatc aagagtgcca ccggtctcag     1080

taatattgtc tcggataaga aagacggtgg gcagtatatg cgatgcaaaa caggtgcgtg     1140

tggtgttctc tcagtgggag actcgtttct tagtggtcat tccaggtatg cagtcgcttt     1200

gccatgccat gtcaaaggaa cttgttccag gctcagtgca cctcaacacc cccgtcgccg     1260

aaattgagca gtcggcatcc ggctgtacag tacgatcggc ctcgggcggc gtgttccgaa     1320

gtaaaaaggt ggtggtttcg ttaccgacaa ccttgtatcc caccttgata ttttcaccac     1380

ctcttcccgc cgagaagcaa gcattggctg aaaaatccat cctgggctac tatagcaaga     1440

tagtcttcgt atgggacaag ccgtggtggc gcgaacaagg cttctcgggc gtcctccaat     1500

cgagctgtga ccccatctca tttgccagag ataccagcat cgaagtcgat cggcaatggt     1560

ccattacctg tttcatggtc ggagacccgg gacggaagtg gtcccaacag tccaagcagg     1620

tacgacagaa gtctgtctgg aaccaactcc gcgcagccta cgagaacgcc ggggcccaag     1680

tcccagagcc ggccaacgtg ctcgagatcg agtggtcgaa gcagcagtat ttccaaggag     1740

cgccgagcgc cgtctatggg ctgaactgtc tcaacacact gggttcggcg ctcagaacgc     1800

cgttcaaggg tgttcatttc gttggaacgg agacgtcttt ggtttggaaa gggtatatgg     1860

aaggggccat acgatcgggt cagcgaggcg ctgcagaagt tgtggctagc ctggtgccag     1920

cagcatag                                                             1928
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<210> 44
<211> 591
<212> PRT
<213> Rhinocladiella atrovirens

<400> 44

Met Ala Leu Ala Pro Ser Tyr Ile Asn Pro Pro Asn Leu Ala Ser Pro
1   5   10   15

107

Ala Gly Tyr Ser Tyr Val Gly Val Gly Pro Asn Gly Gly Arg Tyr Val
        20   25   30

Thr Ile Ala Gly Gln Ile Gly Gln Asp Ala Ser Ala Val Thr Asp Pro
        35   40   45

Ala Tyr Glu Lys Gln Val Ala Gln Ala Phe Ala Asn Leu Arg Ala Cys
        50   55   60

Leu Ala Ala Val Gly Ala Thr Ser Asn Asp Ile Thr Lys Leu Asn Tyr
65   70   75   80

Tyr Ile Val Asp Tyr Asn Pro Ser Lys Leu Thr Ala Ile Gly Asp Gly
                85   90   95

Leu Lys Ala Thr Phe Ala Leu Asp Arg Leu Pro Pro Cys Thr Leu Val
                100   105   110

Pro Val Pro Ala Leu Ala Ser Pro Glu Tyr Leu Phe Glu Val Asp Ala
                115   120   125

Thr Ala Leu Val Pro Gly His Ser Thr Pro Asp Asn Val Ala Asp Val
        130   135   140

Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val
145   150   155   160

Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val
                165   170   175

Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Gly Arg Thr Thr Ile Asn
                180   185   190

Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val Lys
        195   200   205

Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr Thr Gly
        210   215   220

Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala Pro Tyr
225   230   235   240

Gly Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala Glu Leu Leu

108

Pro Ala Ser Gln Leu Ile Glu Glu His Ser Leu Glu Asp Pro Lys Ala
            260   265   270

Ser Pro Gln Ala Lys Gln Leu Asp Ser Val Ser Phe Ala His Tyr Cys
            275   280   285

Glu Lys Leu Asn Leu Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg
            290   295   300

Ala Leu Leu Gly Val Glu Ala His Glu Ile Ser Met Phe Phe Leu Thr
305   310   315   320

Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser Asn Ile Val Ser Asp Lys
                325   330   335

Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Leu
                340   345   350

Cys His Ala Met Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn
            355   360   365

Thr Pro Val Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg
    370   375   380

Ser Ala Ser Gly Gly Val Phe Arg Ser Lys Lys Val Val Leu Pro Thr
385   390   395   400

Leu Tyr Pro Thr Leu Ile Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln
                405   410   415

Ala Leu Ala Glu Lys Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe
            420   425   430

Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu
            435   440   445

Gln Ser Ser Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Glu
            450   455   460

Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly
465   470   475   480

109

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Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp
            485             490             495

Asn Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu
            500             505             510

Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln
            515             520             525

Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Cys Leu Asn Thr Leu Gly
            530             535             540

Ser Ala Leu Arg Thr Pro Phe Lys Gly Val His Phe Val Gly Thr Glu
545             550             555             560

Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly
            565             570             575

Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
            580             585             590


<210>  45
<211>  1928
<212>  DNA
<213>  Rhinocladiella atrovirens

<220>
<221>  Intron
<222>  (739)..(811)
<223>

<220>
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cacgtcggcg taggcccaaa cggagggagg tatgtgacaa tagctggaca gattggacaa     120

gacgcttcgg ccgtgacaga ccctgcctac gagaaacagg ttgcccaagc attcgccaac     180

ctgcgagctt gtcttgctgc agttggagcc acttcaaacg acattaccaa gctcaattac     240

tacatcgtcg actacaaccc gagcaaactc accgcaattg gagatgggct gaaggctacc     300

tttgcccttg acaggctccc tccttgcacg ctggtgccag tgccggccct ggcttcacct     360

gaatacctct ttgaggttga tgctacggcg ctggttccag acactcaac cccagacaat     420

gttgcggacg tggtcgtggt gggcgctggc ttgagcggtt tggagacggc acgcaaagtc     480
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110

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caggctgccg ggctgtcctg cctcgttctt gaggcgatgg atcgtgtggg gggaaagact    540

ctgagcgtac aatcgggtcc cggcaggacg actatcaatg acctcggcgc tgcgtggatc    600

aatgacagca accaaagcga agtattcaaa ttatttgaaa gatttcattt ggagggcgag    660

ctccagagga cgaccggaaa ttcaatccat caagcacaag acggtacaac cactacagct    720

ccttatggtg attccctggt aggcacaatt ccatcttgtg atgagacctc tgtcgtgtgt    780

agaatacagt cgctgactcc acatcgtcca gctgagcgag gaggttgcaa gtgcactcgc    840

ggaactcctt cccgcatggt ctcagctgat cgaagagcat agtcttgaag accccaaggc    900

gagccctcaa gcgaagcagc tcgacagtgt gagcttcgca cactactgtg agaaggatct    960

aaacttgcct gctgttctcg gcgtggcaaa ccagatcaca cgcgctctgc tcggtgtgga   1020

agcccacgag atcagcatgc tttttctcac cgactacatc aagagtgcca ccggtctcag   1080

taatattgtc tcggataaga aagacggtgg gcagtatatg cgatgcaaaa caggtgcgtg   1140

tggtgttctc tcagtgggag actcgtttct tagtggtcat tccaggtatg cagtcgcttt   1200

gccatgccat gtcaaaggaa cttgttccag gctcagtgca cctcaacacc cccgtcgccg   1260

aaattgagca gtcggcatcc ggctgtacag tacgatcggc ctcgggcggc gtgttccgaa   1320

gtaaaaaggt ggtggtttcg ttaccgacaa ccttgtatcc caccttgata ttttcaccac   1380

ctcttcccgc cgagaagcaa gcattggctg aaaaatccat cctgggctac tatagcaaga   1440

tagtcttcgt atgggacaag ctgtggtggc gcgaacaagg cttctcgggc gtcctccaat   1500

cgagctgtga ccccatctca tttgccagag ataccagcat cgaagtcgat cggcaatggt   1560

ccattacctg tttcatggtc ggagacccgg gacggaagtg gtcccaacag tccaagcagg   1620

tacgacagaa gtctgtctgg aaccaactcc gcgcagccta cgagaacgcc ggggcccaag   1680

tcccagagcc ggccaacgtg ctcgagatcg agtggtcgaa gcagcagtat ttccaaggag   1740

cgccgagcgc cgtctatggg ctgaactgtc tcaacacact gggttcggcg ctcagaacgc   1800

cgttcaaggg tgttcatttc gttggaacgg agacgtcttt ggtttggaaa gggtatatgg   1860

aaggggccat acgatcgggt cagcgaggcg ctgcagaagt tgtgcctagc ctggtgccag   1920

cagcatag                                                            1928


<210>   46
<211>   591
<212>   PRT
<213>   Rhinocladiella atrovirens

<400>   46
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111

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Met Ala Leu Ala Pro Ser Tyr Ile Asn Pro Pro Asn Ala Ser Pro Ala
1                 5              10                  15

Gly Tyr Ser His Val Gly Val Gly Pro Asn Gly Gly Arg Tyr Val Thr
              20              25                  30

Ile Ala Gly Gln Ile Gly Gln Asp Ala Ser Ala Val Thr Asp Pro Ala
         35              40              45

Tyr Glu Lys Gln Val Ala Gln Ala Phe Ala Asn Leu Arg Ala Cys Leu
    50              55              60

Ala Ala Val Gly Ala Thr Ser Asn Asp Ile Thr Lys Leu Asn Tyr Tyr
65              70              75              80

Ile Val Asp Tyr Asn Pro Ser Lys Leu Thr Ala Ile Gly Asp Gly Leu
         85              90              95

Lys Ala Thr Phe Ala Leu Asp Arg Leu Pro Pro Cys Thr Leu Val Pro
         100             105             110

Val Pro Ala Leu Ala Ser Pro Glu Tyr Leu Phe Glu Val Asp Ala Thr
    115             120             125

Ala Leu Val Pro Gly His Ser Thr Pro Asp Asn Val Ala Asp Val Val
    130             135             140

Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val Gln
145             150             155             160

Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val Gly
              165             170             175

Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile Asn
         180             185             190

Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val Phe
    195             200             205

Lys Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr Thr
    210             215             220

Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala Pro
225             230             235             240

                                 112
```

```
Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala Glu
            245         250             255

Leu Leu Pro Ala Trp Ser Gln Leu Ile Glu Glu His Ser Leu Glu Asp
            260             265             270

Pro Lys Ala Ser Pro Gln Ala Lys Gln Leu Asp Ser Val Ser Phe Ala
            275             280             285

His Tyr Cys Glu Lys Asp Leu Asn Leu Pro Ala Val Leu Gly Val Ala
    290             295             300

Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile Ser
305             310             315             320

Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser Asn
            325             330             335

Ile Val Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys Thr
            340             345             350

Gly Met Gln Ser Leu Cys His Ala Met Ser Lys Glu Leu Val Pro Gly
            355             360             365

Ser Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala Ser
    370             375             380

Gly Cys Thr Val Arg Ser Ala Ser Gly Gly Val Phe Arg Ser Lys Lys
385             390             395             400

Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Ile Phe Ser Pro Leu
            405             410             415

Pro Ala Glu Lys Gln Ala Leu Ala Glu Lys Ser Ile Gly Tyr Tyr Ser
            420             425             430

Lys Ile Val Phe Val Asp Lys Leu Trp Trp Arg Glu Gln Gly Phe Ser
            435             440             445

Gly Val Leu Gln Ser Ser Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr
    450             455             460

Ser Ile Glu Val Asp Arg Gln Ser Ile Thr Cys Phe Met Val Gly Asp
465             470             475             480
```

113

```
Pro Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val
            485             490             495

Trp Asn Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro
            500             505             510

Glu Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe
            515             520             525

Gln Ala Pro Ser Ala Val Tyr Gly Leu Asn Cys Leu Asn Thr Leu Gly
            530             535             540

Ser Ala Leu Arg Thr Pro Phe Lys Gly Val His Phe Val Gly Thr Glu
545             550             555             560

Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly
            565             570             575

Gln Arg Gly Ala Ala Glu Val Val Pro Ser Leu Val Pro Ala Ala
            580             585             590


<210>   47
<211>   600
<212>   PRT
<213>   Exophiala spinifera

<400>   47

Met Ala Leu Ala Pro Ser Tyr Ile Asn Pro Pro Asn Val Ala Ser Pro
1               5               10              15

Ala Gly Tyr Ser His Val Gly Val Gly Pro Asp Gly Gly Arg Tyr Val
            20              25              30

Thr Ile Ala Gly Gln Ile Gly Gln Asp Ala Ser Gly Val Thr Asp Pro
            35              40              45

Ala Tyr Glu Lys Gln Val Ala Gln Ala Phe Ala Asn Leu Arg Ala Cys
            50              55              60

Leu Ala Ala Val Gly Ala Thr Ser Asn Asp Val Thr Lys Leu Asn Tyr
65              70              75              80

Tyr Ile Val Asp Tyr Ala Pro Ser Lys Leu Thr Ala Ile Gly Asp Gly
            85              90              95
```

114

Leu Lys Ala Thr Phe Ala Leu Asp Arg Leu Pro Pro Cys Thr Leu Val
        100   105   110

Pro Val Ser Ala Leu Ser Ser Pro Glu Tyr Leu Phe Glu Val Asp Ala
        115   120   125

Thr Ala Leu Val Pro Gly His Thr Thr Pro Asp Asn Val Ala Asp Val
        130   135   140

Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val
145   150   155   160

Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val
                165   170   175

Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile
            180   185   190

Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val
        195   200   205

Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr
    210   215   220

Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala
225   230   235   240

Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala
            245   250   255

Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln
            260   265   270

Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe
        275   280   285

Ala His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val
        290   295   300

Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile
305   310   315   320

Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser

115

```
                         325                      330                      335


     Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys
                 340             345             350


     Thr Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro
                 355             360             365


     Gly Ser Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala
                 370             375             380


     Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys
     385             390             395             400


     Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe
                 405             410             415


     Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile
                 420             425             430


     Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp
                 435             440             445


     Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile
         450             455             460


     Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile
     465             470             475             480


     Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser
                 485             490             495


     Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr
                 500             505             510


     Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile
                 515             520             525


     Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr
                 530             535             540


     Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe
     545             550             555             560


                                     116
```

```
Lys Ser Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly
            565                 570                 575

Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val
            580                 585                 590

Val Ala Ser Leu Val Pro Ala Ala
            595                 600


<210>   48
<211>   1392
<212>   DNA
<213>   Unknown

<220>
<223>   Cys (-) APAO; removal of cysteine 461

<220>
<221>   CDS
<222>   (1)..(1392)
<223>

<400>   48
aaa gac aac gtt gcg gac gtg gta gtg gtg ggc gct ggc ttg agc ggt       48
Lys Asp Asn Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly
1                5                   10                  15

ttg gag acg gca cgc aaa gtc cag gcc gcc ggt ctg tcc tgc ctc gtt       96
Leu Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val
            20                  25                  30

ctt gag gcg atg gat cgt gta ggg gga aag act ctg agc gta caa tcg      144
Leu Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser
            35                  40                  45

ggt ccc ggc agg acg act atc aac gac ctc ggc gct gcg tgg atc aat      192
Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn
    50                  55                  60

gac agc aac caa agc gaa gta tcc aga ttg ttt gaa aga ttt cat ttg      240
Asp Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu
65                  70                  75                  80

gag ggc gag ctc cag agg acg act gga aat tca atc cat caa gca caa      288
Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln
                85                  90                  95

gac ggt aca acc act aca gct cct tat ggt gac tcc ttg ctg agc gag      336
Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu
                100                 105                 110

gag gtt gca agt gca ctt gcg gaa ctc ctc ccc gta tgg tct cag ctg      384
Glu Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu
            115                 120                 125

atc gaa gag cat agc ctt caa gac ctc aag gcg agc cct cag gcg aag      432
```
117

```
    Ile Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys
        130             135             140

cgg ctc gac agt gtg agc ttc gcg cac tac tgt gag aag gaa cta aac      480
Arg Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn
145             150             155             160

ttg cct gct gtt ctc ggc gta gca aac cag atc aca cgc gct ctg ctc      528
Leu Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu
                165             170             175

ggt gtg gaa gcc cac gag atc agc atg ctt ttt ctc acc gac tac atc      576
Gly Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile
            180             185             190

aag agt gcc acc ggt ctc agt aat att ttc tcg gac aag aaa gac ggc      624
Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly
        195             200             205

ggg cag tat atg cga tgc aaa aca ggt atg cag tcg att tgc cat gcc      672
Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala
    210             215             220

atg tca aag gaa ctt gtt cca ggc tca gtg cac ctc aac acc ccc gtc      720
Met Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val
225             230             235             240

gct gaa att gag cag tcg gca tcc ggc tgt aca gta cga tcg gcc tcg      768
Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser
                245             250             255

ggc gcc gtg ttc cga agc aaa aag gtg gtg gtt tcg tta ccg aca acc      816
Gly Ala Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr
                260             265             270

ttg tat ccc acc ttg aca ttt tca cca cct ctt ccc gcc gag aag caa      864
Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln
            275             280             285

gca ttg gcg gaa aat tct atc ctg ggc tac tat agc aag ata gtc ttc      912
Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe
    290             295             300

gta tgg gac aag ccg tgg tgg cgc gaa caa ggc ttc tcg ggc gtc ctc      960
Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu
305             310             315             320

caa tcg agc tcc gac ccc atc tca ttt gcc aga gat acc agc atc gac     1008
Gln Ser Ser Ser Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp
                325             330             335

gtc gat cga caa tgg tcc att acc tgt ttc atg gtc gga gac ccg gga     1056
Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly
                340             345             350

cgg aag tgg tcc caa cag tcc aag cag gta cga caa aag tct gtc tgg     1104
Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp
        355             360             365
```

```
gac caa ctc cgc gca gcc tac gag aac gcc ggg gcc caa gtc cca gag      1152
Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu
    370             375             380

ccg gcc aac gtg ctc gaa atc gag tgg tcg aag cag cag tat ttc caa      1200
Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln
385             390             395             400

gga gct ccg agc gcc gtc tat ggg ctg aac gat ctc atc aca ctg ggt      1248
Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly
            405             410             415

tcg gcg ctc aga acg ccg ttc aag agt gtt cat ttc gtt gga acg gag      1296
Ser Ala Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu
        420             425             430

acg tct tta gtt tgg aaa ggg tat atg gaa ggg gcc ata cga tcg ggt      1344
Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly
        435             440             445

caa cga ggt gct gca gaa gtt gtg gct agc ctg gtg cca gca gca tag      1392
Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
    450             455             460


<210>   49
<211>   463
<212>   PRT
<213>   Unknown

<220>
<223>   Cys (-) APAO; removal of cysteine 461

<400>   49

Lys Asp Asn Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly
1               5                   10                  15


Leu Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val
            20                  25                  30


Leu Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser
        35                  40                  45


Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn
    50                  55                  60


Asp Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu
65                  70                  75                  80


Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln
            85                  90                  95
```

119

```
Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu
        100             105                 110

Glu Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu
        115                 120                 125

Ile Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys
        130                 135                 140

Arg Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn
145                 150                 155                 160

Leu Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu
                165                 170                 175

Gly Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile
            180                 185                 190

Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly
            195                 200                 205

Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala
    210                 215                 220

Met Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val
225                 230                 235                 240

Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser
                245                 250                 255

Gly Ala Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr
                260                 265                 270

Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln
        275                 280                 285

Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe
        290                 295                 300

Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu
305                 310                 315                 320

Gln Ser Ser Ser Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp
                325                 330                 335
```

120

```
Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly
        340             345             350

Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp
        355             360             365

Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu
        370             375             380

Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln
385             390             395             400

Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly
            405             410             415

Ser Ala Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu
        420             425             430

Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly
        435             440             445

Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
    450             455             460
```

```
<210>   50
<211>   1392
<212>   DNA
<213>   Unknown

<220>
<223>   Cys (-) APAO; removal of cysteines 359 and 461

<220>
<221>   CDS
<222>   (1)..(1392)
<223>

<400>   50
aaa gac aac gtt gcg gac gtg gta gtg gtg ggc gct ggc ttg agc ggt      48
Lys Asp Asn Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly
1               5               10              15

ttg gag acg gca cgc aaa gtc cag gcc gcc ggt ctg tcc tgc ctc gtt      96
Leu Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val
                20              25              30

ctt gag gcg atg gat cgt gta ggg gga aag act ctg agc gta caa tcg     144
Leu Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser
            35              40              45
```

```
ggt ccc ggc agg acg act atc aac gac ctc ggc gct gcg tgg atc aat          192
Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn
    50                  55                  60

gac agc aac caa agc gaa gta tcc aga ttg ttt gaa aga ttt cat ttg          240
Asp Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu
65                  70                  75                  80

gag ggc gag ctc cag agg acg act gga aat tca atc cat caa gca caa          288
Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln
                85                  90                  95

gac ggt aca acc act aca gct cct tat ggt gac tcc ttg ctg agc gag          336
Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu
                100                 105                 110

gag gtt gca agt gca ctt gcg gaa ctc ctc ccc gta tgg tct cag ctg          384
Glu Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu
                115                 120                 125

atc gaa gag cat agc ctt caa gac ctc aag gcg agc cct cag gcg aag          432
Ile Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys
        130                 135                 140

cgg ctc gac agt gtg agc ttc gcg cac tac tgt gag aag gaa cta aac          480
Arg Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn
145                 150                 155                 160

ttg cct gct gtt ctc ggc gta gca aac cag atc aca cgc gct ctg ctc          528
Leu Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu
                165                 170                 175

ggt gtg gaa gcc cac gag atc agc atg ctt ttt ctc acc gac tac atc          576
Gly Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile
                180                 185                 190

aag agt gcc acc ggt ctc agt aat att ttc tcg gac aag aaa gac ggc          624
Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly
                195                 200                 205

ggg cag tat atg cga tgc aaa aca ggt atg cag tcg att tcg cat gcc          672
Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Ser His Ala
        210                 215                 220

atg tca aag gaa ctt gtt cca ggc tca gtg cac ctc aac acc ccc gtc          720
Met Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val
225                 230                 235                 240

gct gaa att gag cag tcg gca tcc ggc tgt aca gta cga tcg gcc tcg          768
Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser
                245                 250                 255

ggc gcc gtg ttc cga agc aaa aag gtg gtg gtt tcg tta ccg aca acc          816
Gly Ala Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr
                260                 265                 270

ttg tat ccc acc ttg aca ttt tca cca cct ctt ccc gcc gag aag caa          864
Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln
                275                 280                 285
```

122

```
gca ttg gcg gaa aat tct atc ctg ggc tac tat agc aag ata gtc ttc        912
Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe
    290             295             300

gta tgg gac aag ccg tgg tgg cgc gaa caa ggc ttc tcg ggc gtc ctc        960
Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu
305             310             315             320

caa tcg agc tcc gac ccc atc tca ttt gcc aga gat acc agc atc gac       1008
Gln Ser Ser Ser Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp
                325             330             335

gtc gat cga caa tgg tcc att acc tgt ttc atg gtc gga gac ccg gga       1056
Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly
            340             345             350

cgg aag tgg tcc caa cag tcc aag cag gta cga caa aag tct gtc tgg       1104
Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp
        355             360             365

gac caa ctc cgc gca gcc tac gag aac gcc ggg gcc caa gtc cca gag       1152
Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu
        370             375             380

ccg gcc aac gtg ctc gaa atc gag tgg tcg aag cag cag tat ttc caa       1200
Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln
385             390             395             400

gga gct ccg agc gcc gtc tat ggg ctg aac gat ctc atc aca ctg ggt       1248
Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly
                405             410             415

tcg gcg ctc aga acg ccg ttc aag agt gtt cat ttc gtt gga acg gag       1296
Ser Ala Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu
            420             425             430

acg tct tta gtt tgg aaa ggg tat atg gaa ggg gcc ata cga tcg ggt       1344
Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly
            435             440             445

caa cga ggt gct gca gaa gtt gtg gct agc ctg gtg cca gca gca tag       1392
Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
    450             455             460
```

<210> 51
<211> 463
<212> PRT
<213> Unknown

<220>
<223> Cys (-) APAO; removal of cysteines 359 and 461

<400> 51

```
Lys Asp Asn Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly
1               5               10              15
```

123

Leu Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val
      20   25   30

Leu Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser
      35   40   45

Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn
      50   55   60

Asp Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu
65   70   75   80

Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln
            85   90   95

Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu
        100   105   110

Glu Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu
        115   120   125

Ile Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys
      130   135   140

Arg Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn
145   150   155   160

Leu Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu
        165   170   175

Gly Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile
        180   185   190

Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly
      195   200   205

Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Ser His Ala
      210   215   220

Met Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val
225   230   235   240

Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser
        245   250   255

```
Gly Ala Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr
            260             265             270

Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln
        275             280             285

Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe
    290             295             300

Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu
305             310             315                 320

Gln Ser Ser Ser Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp
            325             330                 335

Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly
        340             345             350

Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp
        355             360             365

Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu
    370             375             380

Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln
385             390             395                 400

Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly
            405             410             415

Ser Ala Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu
        420             425             430

Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly
        435             440             445

Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
    450             455             460


<210>   52
<211>   1392
<212>   DNA
<213>   Unknown
```

125

<220>
<223> Cys (-) APAO; removal of cysteines 169, 359, and 461

<220>
<221> CDS
<222> (1)..(1392)
<223>

<400> 52

```
aaa gac aac gtt gcg gac gtg gta gtg gtg ggc gct ggc ttg agc ggt      48
Lys Asp Asn Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly
1               5                   10                  15


ttg gag acg gca cgc aaa gtc cag gcc gcc ggt ctg agc tcc ctc gtt      96
Leu Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Ser Leu Val
                20                  25                  30


ctt gag gcg atg gat cgt gta ggg gga aag act ctg agc gta caa tcg     144
Leu Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser
            35                  40                  45


ggt ccc ggc agg acg act atc aac gac ctc ggc gct gcg tgg atc aat     192
Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn
        50                  55                  60


gac agc aac caa agc gaa gta tcc aga ttg ttt gaa aga ttt cat ttg     240
Asp Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu
65                  70                  75                  80


gag ggc gag ctc cag agg acg act gga aat tca atc cat caa gca caa     288
Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln
                85                  90                  95


gac ggt aca acc act aca gct cct tat ggt gac tcc ttg ctg agc gag     336
Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu
            100                 105                 110


gag gtt gca agt gca ctt gcg gaa ctc ctc ccc gta tgg tct cag ctg     384
Glu Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu
        115                 120                 125


atc gaa gag cat agc ctt caa gac ctc aag gcg agc cct cag gcg aag     432
Ile Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys
    130                 135                 140


cgg ctc gac agt gtg agc ttc gcg cac tac tgt gag aag gaa cta aac     480
Arg Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn
145                 150                 155                 160


ttg cct gct gtt ctc ggc gta gca aac cag atc aca cgc gct ctg ctc     528
Leu Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu
                165                 170                 175


ggt gtg gaa gcc cac gag atc agc atg ctt ttt ctc acc gac tac atc     576
Gly Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile
                180                 185                 190


aag agt gcc acc ggt ctc agt aat att ttc tcg gac aag aaa gac ggc     624
Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly
```

126

ggg cag tat atg cga tgc aaa aca ggt atg cag tcg att tcg cat gcc   672
Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Ser His Ala
        210   215   220

atg tca aag gaa ctt gtt cca ggc tca gtg cac ctc aac acc ccc gtc   720
Met Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val
225   230   235   240

gct gaa att gag cag tcg gca tcc ggc tgt aca gta cga tcg gcc tcg   768
Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser
                245   250   255

ggc gcc gtg ttc cga agc aaa aag gtg gtg gtt tcg tta ccg aca acc   816
Gly Ala Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr
            260   265   270

ttg tat ccc acc ttg aca ttt tca cca cct ctt ccc gcc gag aag caa   864
Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln
        275   280   285

gca ttg gcg gaa aat tct atc ctg ggc tac tat agc aag ata gtc ttc   912
Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe
    290   295   300

gta tgg gac aag ccg tgg tgg cgc gaa caa ggc ttc tcg ggc gtc ctc   960
Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu
305   310   315   320

caa tcg agc tcc gac ccc atc tca ttt gcc aga gat acc agc atc gac   1008
Gln Ser Ser Ser Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp
                325   330   335

gtc gat cga caa tgg tcc att acc tgt ttc atg gtc gga gac ccg gga   1056
Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly
            340   345   350

cgg aag tgg tcc caa cag tcc aag cag gta cga caa aag tct gtc tgg   1104
Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp
            355   360   365

gac caa ctc cgc gca gcc tac gag aac gcc ggg gcc caa gtc cca gag   1152
Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu
        370   375   380

ccg gcc aac gtg ctc gaa atc gag tgg tcg aag cag cag tat ttc caa   1200
Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln
385   390   395   400

gga gct ccg agc gcc gtc tat ggg ctg aac gat ctc atc aca ctg ggt   1248
Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly
                405   410   415

tcg gcg ctc aga acg ccg ttc aag agt gtt cat ttc gtt gga acg gag   1296
Ser Ala Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu
            420   425   430

acg tct tta gtt tgg aaa ggg tat atg gaa ggg gcc ata cga tcg ggt   1344

127

```
Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly
        435             440             445

caa cga ggt gct gca gaa gtt gtg gct agc ctg gtg cca gca gca tag      1392
Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
        450             455             460
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<210> 53
<211> 463
<212> PRT
<213> Unknown

<220>
<223> Cys (-) APAO; removal of cysteines 169, 359, and 461

<400> 53

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Lys Asp Asn Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly
1               5                   10              15


Leu Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Ser Leu Val
        20                  25                  30


Leu Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser
        35                  40                  45


Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn
    50                  55                  60


Asp Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu
65                  70                  75                  80


Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln
                85                  90                  95


Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu
                100                 105                 110


Glu Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu
        115                 120                 125


Ile Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys
        130                 135                 140


Arg Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn
145                 150                 155                 160


Leu Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu
```

128

Gly Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile
　　　　　　180　　　　　　　　185　　　　　　　190

Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly
　　　　　195　　　　　　200　　　　　　205

Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Ser His Ala
　　　210　　　　　　215　　　　　　220

Met Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val
225　　　　　　230　　　　　　235　　　　　　240

Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser
　　　　　245　　　　　　250　　　　　　255

Gly Ala Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr
　　　　260　　　　　　265　　　　　　270

Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln
　　　275　　　　　　280　　　　　　285

Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe
　　　290　　　　　　295　　　　　　300

Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu
305　　　　　　310　　　　　　315　　　　　　320

Gln Ser Ser Ser Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp
　　　　　325　　　　　　330　　　　　　335

Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly
　　　　340　　　　　　345　　　　　　350

Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp
　　　　355　　　　　　360　　　　　　365

Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu
　　　370　　　　　　375　　　　　　380

Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln
385　　　　　　390　　　　　　395　　　　　　400

```
Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly
            405             410             415

Ser Ala Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu
            420             425             430

Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly
            435             440             445

Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
    450             455             460
```